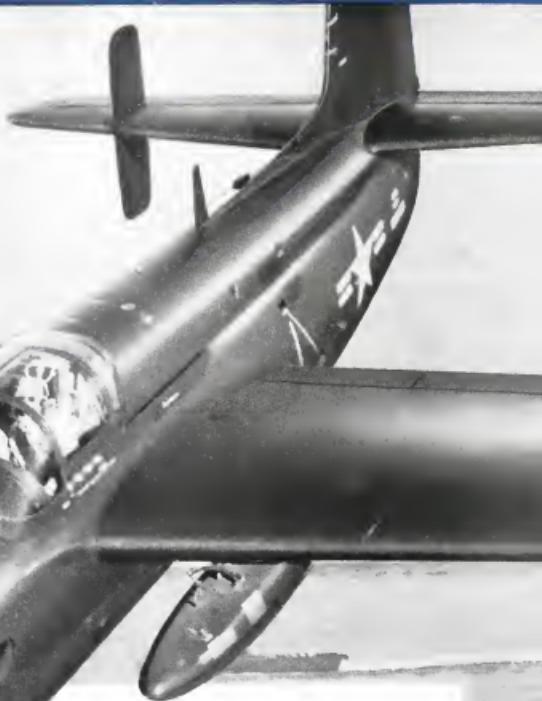


# AVIATION WEEK

A McGRAW-HILL PUBLICATION

JULY 16, 1951

\$6.00  
A YEAR



## SUBMARINES BEWARE!

A fast lens catches a GRUMMAN GUARDIAN in mid-air close-up. Two versions of this carrier-based plane work together to protect ships of the U.S. Navy from submarine attack. Some GUARDIANS carry powerful detection devices. When these "hunters" locate an undersea enemy, more heavily armed, bomb-carrying GUARDIANS, like the one shown here, come in for the "kill."

GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETHLEHEM

Contractors to the Armed Forces

Solves high-altitude pumping problem!



Compact new Sundstrand control oil pump developed for high-flying jets

Highly unusual part of a fuel regulator for jet engines is this remarkably compact control oil pump developed by Sundstrand. Its patented "Rock-Roll" pumping principle provides special characteristics for high altitude performance and assures a uniform flow at high altitudes. The compactness of its eccentric design and its favorable high speed characteristics make it possible to fit this pump into an extremely limited space. Success of its original application already has led to adaptations for other purposes. Developed in answer to a request for a control actuator, it is a typical example of the results stemming from Sundstrand's reliable research, expert engineering, precise production. For data on this pump, come to Sundstrand.



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**B.F. Goodrich**



## A seal that saves muscle zips off to save time

Borrowed from aircraft jet powered surface aircraft in the B-47 Strategic Bomber, the seal is made of a flexible, light and smooth. They decided to have short metal controls, too, for emergencies.

When it came to the elevation, they ran into a problem. They wanted to fit a flap between the elevator and the horizontal stabilizer. The purpose was to prevent flow out through the flap slot, resulting in rapid separation of the controls much earlier.

But there was a catch. Removing the flap for elevator maintenance would be a long, costly job.

B.F. Goodrich engineers had in idea that BFG Pressure Sealing Zippers, which had passed the crack test for aircraft seals, would work just as well in elevators. They showed them some right.

The upper overlapping rubber lip provides a 100% effective seal against air pressure. It can be easily unzipped to expose the elevators.

And the upper flap part provides a flat surface to prevent separation. The zipper separates from the lower flap after another to detach the flap seal, the chassis can simply snap it. At a new elevation is installed, the new and old halves of the upper mesh perfectly.

B.F. Goodrich Pressure Sealing Zipper

fits snugly around complex shapes. They can be unzipped and easily folded or metal. They are light and weight. Successful applications include surface doors, air ducts, interior covers and a straight protective coverage.

For information on Pressure Sealing Zippers, their construction, applications and available sizes, write for a free copy of our new booklet, *Hold Everything*. The B.F. Goodrich Company, Aeronautical Division, Akron, Ohio.

**B.F. Goodrich**  
FIRST IN RUBBER





Photo: AFMUSC/2010

## UTILITY

Whether coated vehicles or a huge hall-back personnel carrier, key for movement of livestock or litter for evacuation of wounded, transport of replacement troops to forward areas or passengers to pump areas—loading and unloading will be simple—safe, speedy delivery assured.



## SIDLIGHTS

### No More XC-99s

Implementation is underway at Charles W. Wilson's quarterly report to the President that the serviceability of the Douglas C-114 would be Consolidated-Vultee's XC-99, the transport version of the B-52. Wilson had asked USAF for a one-month extension of the latest plant inspection, now set for 10 July, of the XC-99 aircraft with the rest of its mobile Air Force spokesman says, "We neither production of the XC-99 is contemplated." Since in case of Repulse, XC-99s never fly into acceptance.

### Those 'Underground Runways'

The current report that Navy is converting 114 aircraft from "underground runways" in North Africa is labeled false by Navy officials. Navy tells Aviation Week it has only one base—Port Lyautey—on the North African coast. It's possible the rumor comes following a recent fit in an underground ammunition storage facility in that vicinity.

### Air Force Roundup

USAFA has awarded Convair a new contract for further modification and overhauled of B-58s. The contract, covering conversion of 12 B-58s to B-58D, was let in 1964 and will continue through 1972. A new survey shows 47% of USAF regular officers are college graduates, in contrast to Navy with 47% and Army with 72%. USAF planes have had 44 losses since Korean hostilities began, but the losses are not necessarily due to combat, 39 of which 21 are described as "accidents." Far East Air Force has flown 22,000 sorties during 31 weeks of combat covered in the report.

Air Force Headquarters—which makes equipment deliveries and personnel strength in being—will be the new post next year. The Secretary, Space and Defense, expenditures of \$6.237 billion for the 1970 fiscal year, ended July 1, compared with \$5.726 billion for the 1969 fiscal year. The B-58 will soon be reactivated. The big bomber's strategic role is now on a long lead and USAF has not yet made a final decision on its future. After the test, it will be grounded at a school to train ground crews. USAF procurement has a critical shortage of inspectors and ranks eighth as greatest people for Chicago, South Bend, Milwaukee, Indianapolis, Minneapolis and St. Louis. In radio & television, Fort Lauderdale, and in paper, Convair Mid-Atlantic Air Procurement District Office, Chicago.

### The Press

Western Flying magazine changes its name to Western Aviation and will be published by Western Publishing Co., Los Angeles, which publishes Western Aviation and other newspapers. First June 29. (Continued on page 94)

## NEWS DIGEST

### DOMESTIC

Ryan Aeromarine Corp. has been awarded a contract by Douglas Aircraft Co. to build a small number of complete rocket motors for a surface-to-surface missile being developed by the latter for Air Force.

Brig. Gen. Donald F. Stoen, commanding general of the Western Air Procurement District in Los Angeles, has applied for retirement from active duty. He will be succeeded by Brig. Gen. William M. Morgan, Deputy Commander of the Western Air Defense Force. Stoen has headed the USAF's western purchasing organization, first as AFMUSC in 1953, then as its successor from 1959 to 1960.

Army-Air Force members of Ft. Bragg and Camp Mackall, N. C., between Aug. 11-Sept. 2, will receive about 180,000 hours and approach nearly 400 planes. Designated Southeast Asia Pic, the exercise is planned to be the largest peacetime U.S. military training mission in numbers of men since World War II.

National search mark of 367 was set out by Richard Johnson at the 19th National Safety Council, on 27 Sept. 27, 1966. El Paso, N. M., Johnson kept her 84-5 single-seater shell for eight hours and bettered the previous record by 42 ss.

Los Angeles Airways' third chapter ends, period in three weeks, has resulted in LAA providing all its surviving craft with the craft as reorganized. The main service Sikorsky S-51 has the general name Phoenix, Calif., piloted by CAA inspector Werner Ellis who was flying the craft and helping LAA pilot John Dehnhard. Phoenix' cockpit accident an oil leak when tail anti-sabot failed. Damage to blades and rotor head was repaired.

Huge aircraft maintenance depot, to cost approximately \$62 million, is planned by the USAF at MacDill, Fla. The new depot, which will employ up to 10,000, will have a narrow capability of handling all planes now being used as projected, according to a USAF spokesman. It will augment the present MacDill AFB, about 25 or distant.

F&W E-2000-9, fitted to a MATS C-141 recently set a mark of 3,000 flying hours without overhaul, without any sign of breakdown. The normal time for this engine is 1,200 hr to the engine

set down under inspection ranging from 120 deg. F. to below zero, and was subjected to arduous and varied water.

Civil Aeromarines Board plans to appeal recent Washington, D. C. district court ruling upholding CAB's finding that a number of large aircraft monthly by certain associations in three a month between cargo rates and eight a month between pairs of other cities CAB will now take the ruling before the Court of Appeals, and postpone the effective date of its ruling until after the outcome of its new appeal.

Defense Production Administration has awarded the subassembly contract at El Centro, Calif., to Lockheed Corp. for defense housing. The El Centro subassembly contract was issued to more than 1,000 military and civilian personnel from Wright-Patterson AFB. El Centro Air Station is designated as a prime parasite unit center.

### FINANCIAL

McDonnell Douglas has reported a net profit of \$24,511 for May, after provision for taxes. Operating revenue since \$132,356, on 27.7 percent increase from 1966. Net profit for the first five months of 1970 was \$60,493, against \$39,969 for the same period last year. Loss on the carrier's land service rates, not in operation during the 1968 period, was blamed.

Pan American World Airways declared a dividend of 25 cents a share, payable Aug. 6 to holders of record July 30. This is the first dividend since 1963, previous to the acquisition of 50% rights being paid Dec. 31, 1969.

### INTERNATIONAL

George Godfrey Smith, MBE, a director of the Associated Milk Producers of Bally & Sons, and managing editor of the magazine The Pulse, including Flight magazine, for which he was probably best known—died at his home in Redditch, England, June 28. He was 67. Smith was also well known for his book, Get Together and Jet, first published in 1947.

Canadian Pacific Airlines has purchased three DC-9s from Douglas Aircraft Co. for its trans-Pacific operations to Australia and Japan. The DC-9s are scheduled to replace Canadian DC-9s with North Star sold to Trans Canada Air Lines.

## GOOD READING FOR GOOD BUYING

A complete listing of Aerospace's products for the aviation industry—**ROTODRIVE**, **NEOSTAR**, **Balance arm**, **TRUSS**, **STABILIZER**, **tailplane** and **ANEROID**, **regulating**, **level gear**, **drive**, **undercarriage**, **tail**, **water**.

Civil Aeromarines Board plans to ap-

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the Court of Appeals, and postpone

the effective date of its ruling until

after the outcome of its new appeal.

An index copy of this informative insert is yours on request.



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## WHO'S WHERE

### In the Front Office

**Henry S. White** has been appointed vice president of traffic and sales for Southwest Air Service. White is a graduate of the carrier and also is the head of the Aeromarine Division.

**World A. Olson** has been named vice president of traffic and sales for Pacific Northwest Airlines. A veteran of 10 years in air transport, Olson holds administrative posts with American Airlines and Capital Airlines holding the positions of general traffic and sales manager, 1954-1956.

**Raymond D. Archibald** has been designated vice president of engineering of Malvern Graphical Laboratories, Tulsa. He was formerly on the staff of the defense analysis and control laboratories at Massachusetts Institute of Technology, where he had been responsible for the development and analysis of ballistic missile components and requirements for the MIT three-stage flight tests as well as the missile proper. Mervin Donald G. Olson has been named chief engineer.

### Changes

**F. N. Jones**, consultant to Air Materiel Command, has been named by Boeing Airplane Co. as liaison consultant on piston aircraft matters. His first assignment is at the Wichita division.

**Walter A. Krebsbach** has been assigned manager of materials and purchasing for General Electric Co. A T. Chalmers has been appointed manager of GE's Lycoming (Mo.) Testbed division and Wallace V. O'Brien has been named manager of the firm's Springfield Manufacturing division. O'Brien succeeds Charles H. Lovell, who heads GE's public relations organization.

Robert Lewis and John F. Kennedy have been named superintendents of two plants in male parts for Boeing Materiel division's Wright 181 Super 90 engine plant, which the division will build in male houses. Lewis will be in charge of the engine plant's assembly and maintenance parts for the 747 and Kennedy will work at the factory handling steel and iron parts machining and making of subassemblies.

**Richard Givens** has been placed in charge of a new engineering and planning department set up in Los Angeles Aircraft Inc. He was previously general supervisor of technical and production functions for Lockheed Air Ferries.

**J. E. Fehder** has been named assistant division manager of Convair's San Diego division.

**H. L. Roberts** has been appointed manager of the new regional office of the Air Transport Association at Ft. Worth, Tex.

**Hold R. Lakin** has been appointed works manager for Kansas Aircraft Corp. and Products, Inc., has been named chief of quality control.

**Jack R. Ruth**, a new military planning assistant to the western regional office of the NACA, Wright P. Army Air Forces has been placed in charge of the technical relations depart-

## INDUSTRY OBSERVER

► **Chase Aircraft Co.** NC-123 crashed during takeoff at Eglin AFB, Fla., following completion of initial long range route competition trials between two planes, the Fairchild C-119 and a Douglas Super DC-3. Motors generate tales of the plane during takeoff showed that the left Pratt and Whitney R-2820 failed just after the plane became airborne. The pilot was killed.

► Large scale military transport production orders for next several years has been crystallized by Peaseau planners assault—Chase C-123, medium transport cargo—Fairchild C-119, long-range freight and personnel—Douglas DC-6s and Lockheed Super Constellation 149A, strategic bombers—Douglas C-134, aerial tankers—Boeing KC-97, all purpose transports—Lockheed L-1049.

► New-type transports on order and available for software conversion in an emergency by U. S. and allied foreign crews are apparently as follows: 180 Douglas DC-6A and B, 90 Constellation 749As and 340C, 100 Martin 4-0-4s and 100 Convair 340s.

► The Roots of Canada Ltd., subsidiary of a British firm, has acquired a \$500,000 property purchase from the city of Toronto for the building site of a \$2-million aircraft precision instrument manufacturing plant. Construction is expected to take 18 months.

► **Boeing Airplane Co.** is moving four departments—B-50 fuselage struts, B-50 and B-36 wing struts, engine subassemblies and engine assemblies from its Seattle Plant 2 to Renton, Wash., to make room for contemplated B-37 production. The move involves shift of approximately 1,100 employees and completes the switch of B-50 and C-70 assembly work to Renton.

► North American Aviation's digital differential analyzer, built by Computer Research Corp., is being installed aboard one of the company's aircraft to determine answers to electroacoustical problems encountered during flight testing of guided missile components. Computer data will provide the machine suitable under varying conditions of altitude, temperature and aircraft-type vibrations.

► **Country delivery** of Sweden's own jet fighters, the Saab 29 "Flying Saucer" have surprised the F-13 dayfighter wing of Nicheleng with replacements for its de Havilland Vampires. The F-13 wing was the first Swedish unit to fly the Vampire, back in 1946.

► First photo of the Tu-10, swept-wing fighter at border of the Red Air Force shows the installation of wing fairings. Four new MiG-19s—approximately two kip ahead of length. Aircraft is in equation service throughout the Red zone of Germany, and appears frequently over Berlin.

► **Curtiss Wright Corp.** has entered into agreement to purchase Buffalo Shovel Casting Corp., Buffalo, N. Y., subject to confirmation of later company's stockholders who will meet July 19. If deal is made, C-W management will move in fast and set up plant for manufacture of ceramic blades, probably under a new C-W division. Blade process under consideration is a "splat" technique in which mold is sprayed with plastic to give very precise, smooth product.

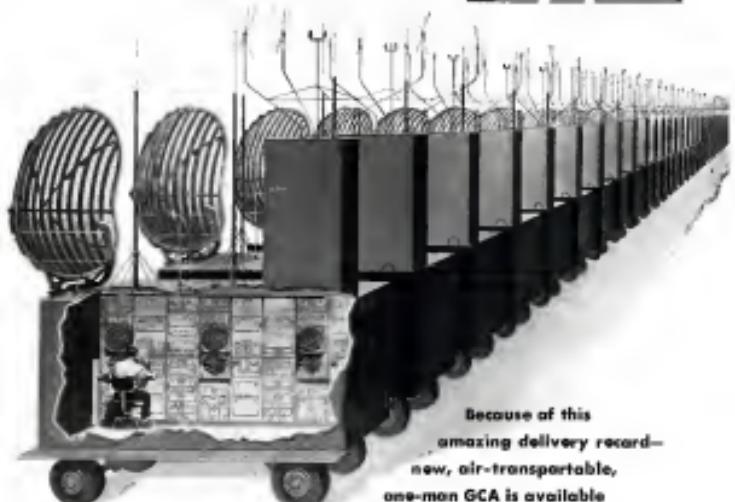
► Purchase of a Convair 340 is being studied by Curtiss-Wright for purpose of using the aircraft as a test vehicle for its T-40-Canardized B-5150.

► Prototype YB-47C Stratofort will make its first flight later this year. Power will be furnished by four Allison J35 A-15s instead of the six jet units in the B-47B.

► **Douglas X-3**, Air Force's new supersonic research craft, is being studied for flight in mid-1954. Convair's double-bridge stabilizer section. Reported design performance is 2,250 mph at nearly 300,000 ft. ultimate

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## Gilfillan

LOS ANGELES, CALIFORNIA

# AVIATION WEEK

VOL. 55, NO. 3

JULY 16, 1951

## Truce May Slow, But Not Halt Production

Korean peace may bring cut in military budget  
now before Congress, but air buildup will continue.

Present backlog stay the same, and that means  
a high level of business for some time to come.

Delivery dates may be pushed back, but still output  
for rest of this year will go on much as scheduled.

Prospects of a truce in the Korean war last week staved off Defense Department officials to quick action to ward off a threatened cut in military spending.

Government and industry are still cut off but no word yet about any immediate cutbacks in production, that isn't in the cards.

Production may be slowed down—but not stopped. That could not be a certainty. Production would continue to build up, but at a slower rate.

And we are in the fiscal 1952 military budget now before Congress would still leave the manufacturing industry giddy with orders. Backlogs of the 15 leading companies are estimated to total \$7.6 billion (page 69). This means good business for several years.

But the one spot is this:

At the very time negotiations in Korea were declining for a truce, Air Force and Navy were asking the Joint Chiefs of Staff to approve proposed increases for the fiscal year 1952, which begins July 1, 1952.

► **Air Force**—USAF wants its present goal of a 35-wing force by July 1952 raised to 120 wings by July 1953. But it would settle for a more modest boost toward 100 wings. The 120 wing plan would require \$5 billion more than the \$18.8 billion allowed by the Administration for the 1952 fiscal year to achieve a fully sustained 95-wing force by July 1952, and require about \$21 billion during the 1953 fiscal year.

As of now, this is off. There's no likelihood of increasing the 50% defense budget for the fiscal year. At best, JCS will approve a build up to 150 wings during the 1953 fiscal year.

The Navy wants its present goal of 15 carrier wings by July 1952 raised to 18.25 wings by July 1953. The Navy's expansion has been the most modest of the three services.

The Air Force has been emphasizing the de-mobilization and re-

enlistment wanted it to. Wilson's proposal is off.

"Delays are currently about two-thirds higher than a year ago. For the most part, this increase reflects the expansion of the forces that was already planned before Korea, plus whatever speed-up could be achieved in planes that were in operation at that time."

"Present schedules call for tripling the current rate of delivery in the next 12 months or so, which is a big increase but still somewhat short of targets set by the President when he proclaimed the national emergency." At that time, the President called for a five-fold increase.

In a way, this administration is a great triumph for the Air Force, which all along has been unhappy about the philosophy of building a "core of production" rather than giving the greatest attention to volume production or quantity production.

► **Aircraft**—Military aircraft production for the first quarter of this year dropped badly—to a low point in fact, that military planners visited release of military aircrafts' weight production figures beyonds of their possible international political effect.

Since then, the buildup has started in earnest and it is still buildup for production that was in triple last year's output.

The key point in the Korean truce situation is that no matter what happens the effect on production this year will be slight—or none at all.

The reason is that it's hard to believe that many Air Force people would not be in uniform if a Korean settlement would be at a slower pace of production. It would be easier then to go back to their preferred way of procurement: through bidding, and modification after modification to keep up with the rapidly changing technology and operational demands.

► **No Letdown**—The thing shown was remarkable, but was it not that the Defense plan to fit in build up was foisted before the Korean War began? The record was simple.

Senator Thomas K. Fraktler highlighted it in a television interview last week. These terms he emphasized the importance of the strategic air arm. This, plus Administration warnings against a letdown made it more critical production would not be paid back to pre-Korean status.





# French Show Progress in Civil Planes

Advanced design of lightplanes offers best chance for leadership.

By Ross Hartline  
McGraw-Hill World News

Part-French-built light planes, including some of the world's newest, made the show at the Northeastern International Air Show in Paris.

Although military planes dominated in numbers both of the vast exhibition hall in the Grand Palais and at the flying demonstration, Le Bourget field (AVIATION WEEK July 9, p. 17), visitors crowded steadily about the light planes, especially light planes made in France, which are the best known for pleasure and competition.

► **Close to France-France** apparently is developing more than planes. It has a record tak about 10 in the field of light planes, especially light planes made in France, which are the best known for pleasure and competition.

Four of the new French light planes were particularly outstanding. The SIPA 200, a tiny jet-propelled two-seater that can be sold for \$17,000 to \$15,000, was the top attraction among sport planes.

The SIPA 200 is powered by a Turbomeca Palas turboprop with 155-lb thrust and has a maximum speed of 367 mph. It cruises at 236 mph. The plane's wingspan is 26.90 ft, and it carries two persons 110 and 175 miles.

Dimensions: wingspan 23.6 ft, length 35.5 ft, height 5.8 ft, weight empty 636 lb, weight loaded and carrying two persons 1,390 lb. The plane has a retractable tricycle landing gear. It is of all metal construction.

► **Strega Design-Aircraft** other interesting small planes were:

• **Forger Cygno II**, another jet built and designed for competitive flying. It makes it possible to be used both as a large and advanced flight school. The Cygno II is a modern monoplane powered by a Turbomeca Palas turboprop. It made its first flight Aug. 18, 1951.

Its maximum speed is 217 mph, and its initial rate of climb is 1,274 fpm. Dimensions: span 29 ft, length 22 ft, height 5 ft 10 in, weight empty 944 lb, weight loaded 1,373 lb, ceiling 29,327 ft, range 187 mi.

• **Forger Geronimo II** is basically a jet two-seater wing section. Equipment and controls are the same as both cockpit in that either engine can operate separately.

The Geronimo is designed to answer the requirements of a two-seat aircraft for passenger and special cargo, needs. Its maximum speed is 265 mph.



LIGHTPLANES DOMINATED the scene at the 1951 Paris Air Show.



SIPA 200.



Hurel Dubois HD 10



Strega HD 10



Forger Cygno II



Avrault 501B



Nord 2500

Its initial rate of climb is 1,083 fpm, range 31,366 ft, range 187 mi.

The plane has fixed forewheel landing gear. It made its first flight May 7, 1951. Dimensions: span 35 ft, 8 in, length 22 ft, height 5 ft, 6 in, weight empty 1,395 lb, weight loaded 2,381 lb.

• **Hurel Dubois HD 10** is an experimental aircraft with a long, very narrow wing that has been under test since its first flight Aug. 5, 1948. Its author, the HD 10's high aspect ratio wing is 13.22, backed by lift that gives a lifting force 10 times greater than the weight level of the aircraft's empty weight.

Hurel Dubois claims the wing design improves flying performance and enables the plane to carry 30 to 40 percent greater weight with the same power and at the same cruising speed as planes with conventional wings. The company now is building a medium cargo plane utilizing the same principle.

The HD 10 is powered by a Praga T50B engine. Its maximum speed is 158 mph. It is equipped with a retractable tricycle landing gear. Dimensions: span 34 ft, 6 in, length 16 ft 10 in, weight empty 1,575 lb, weight empty 2,600 lb, weight empty 4,335 lb, weight loaded 4,365 lb, weight loading 2174 lb/sq. ft., power loading 15 lb/sq. ft.

► **Target Plane**—in a far corner of the exhibition hall the French Air Arsenal exhibited for the first time its palpitant radio-controlled target plane, the Avrault 501. The target plane can be launched either from a 50-ft catapult or from a pickup truck position on a plane in flight. It is controlled in flight by radio and by a gyroscopic stabilizer. It lands by means of a parachute sold by two solid rubber cords off by a proximity fuse to assist in shortening the landing climb.

The Avrault 501 can climb to 13,600 ft, in nine minutes and reach a maximum speed of 590 mph at that altitude. It can stay in the air about 45 minutes. Its ceiling is 19,300 ft, and it can be controlled by radio to a maximum range of 31.25 mi.

Dimensions: span 18 ft, 1 in, length 39 ft, 6 in, height 5 ft, 2 in, total weight 1,452 lb.

► **Transport**—in the field of transport aircraft, the French aircraft industry showed off four planes. All four have been thoroughly tested and are now being produced in series.

The largest of the group is the Nord 2500 Armagnac, a four-engine monoplane designed for trans-Atlantic routes. Pilatus Armagnac have been ordered, and the first flight is scheduled to be delivered to Air France at the beginning of 1952.

• **Armagnac** can carry a maximum payload of 15 tons at a cruising speed of 360 mph. Its range with a full payload

at 1,250 cu. ft. with a load of only 100 lbs., its range is 4,640 mi. The plane can carry 54 full-size passengers or 160 third-class passengers. It is powered by Pratt and Whitney engines of 3,900 hp, each.

Dimensions: span, 199 ft., l. m. length 125 ft., 9 in., height 47 ft., 7 in., weight empty 4,070 lbs.

\*Breguet 76 "Doux Pois" (double decker) was designed to carry cargo or passengers over distances of up to nearly 1,900 mi. Its fuselage is divided into two decks to give it a very large carrying capacity. It can carry 100 passengers in two decks, or 99 passengers on the upper deck and eight 16 in. beds of freight on the lower, or a maximum total cargo load of 15 tons on both decks.

The plane is powered by two Pratt and Whitney R 2800 CA 38 engines of 2,400 hp, each. French designer "Doux Pois" is under construction. Air France expects not to put the first of these into service in the year before December 1958. It has a span of 141 ft., 1 in., length 97 ft., 3 in., height 11 ft., weight empty 18,400 lbs. Its cruising speed is 330 mph.

\*SO 30 P "Tortuga" is a two-engine medium transport that already is in service on Air Mexico and Air Algarve boats. Details of the planes have been provided to date and another 25 are on order or under construction.

The later models of the "Tortuga" are powered by Pratt and Whitney R 2800 CA 16 engines that give it a cruising speed of 287 mph at 16,400 ft. The plane's maximum range is 55 percent of takeoff power in 1,982 mi., and it can carry 3,000 lbs. payload 512 miles at 95 percent of takeoff power.

Dimensions: span 95 ft., 2 in., length 62 ft., 2 in., weight empty 20,994 lbs., total weight 43,960 lbs.

An experimental version of the "Tortuga" has been fitted with Hispano Novo turboprop engines. This plane, the SO 30 "Nana," made its first flight on May 15, 1958. Its performance has not yet been made public.

\*Nord 2501 is a two-engine military transport powered by British Bristol engines of 2,090 hp, each. A total of 1,500 these aircraft are now in service. The plane has a maximum range of 1,000 mi., and it can carry 40 passengers or 1,000 lbs. of freight. It carries 945 gallons of fuel in the central section of the wings, and its range with a load of 31,500 lbs. is 932 mi. Its maximum speed is 274 mph, and its cruising speed 205 mph.

Dimensions: span 104 ft., 7 in., length 61 ft., 8 in., height 47 ft., 6 in., weight empty 12 tons, total weight 28 tons.

\*Maeil Renault MD 315 is a two-engine military transport of which 300 have been produced or are on order

Three French military liaison squadrons already are equipped with this type of plane.

The MD 315 is a low-wing monoplane with two 160 hp. Its maximum speed is 126 mph, and its cruising speed 100 mph. Its range is 199 mi. It is powered by SNECMA 11.8 engines and carries ten passengers. Dimensions: span 49 ft., length 32 ft., height 15 ft., weight empty 9,189 lbs., total weight 12,565 lbs.

\*Helicopters-Virtually to the exhibition in the Grand Palais this year could hardly be dying now as it did throughout the 1950s. From the first experimental helicopter terminal at the Grand Palais, just across the Seine from the exhibition hall, and at Le Bourget on July 1, 1958, in flight what the French claim is the world's first jet-propelled helicopter, the SO 36 Anril III.

The Anril III is powered by a Turbomeca Astazou turbine giving 273 hp. Its rotor is driven by combustion chamber heat at the top of the blades. Contaminated air is fed through the hollow outer blades to the combustion chamber where fuel is ignited.

It has a maximum speed of 112 mph and a cruising speed of 66 mph. Ceiling is 8,500 ft. and service ceiling 11,120 ft. Fired with two seats it can fly at 50 mph for a period of two hours and 45 minutes.

The Anril III, one of the present achievements of the French aviation industry, stood squarely in the center of the exhibition hall. Two other French helicopters—the SK 312 and the two rotor Breguet DK 312s—also were on display. The only American or British planes in the Grand Palais were helicopter—the Bell 47 D1 and the Breguet 175. March 22.

Undoubtedly the preoccupation of helicopter men in Paris show was partly due to the fact that helicopters are among the easiest and most interesting aircraft to develop and fly. But visitors come away with the impression that the emphasis on helicopter this year was also a due to the future of aviation—a future in which the originally but extremely useful helicopter could be expected to play an important part.

## Navy Names Kamman In Gas-Turbine Test

Kamman Aircraft Corp., Waco, Texas, Calif., is a winner winner of a Navy competition for development engineering studies utilizing the gas turbine engine as power plant for helicopters.

Kamman, whose proposal was adjudged as the most comprehensive among those entered by several major helicopter companies, will conduct its research tests

using the Boeing developed 932-2 gas turbine as a helicopter engine.

The Boeing 932 is a small propeller engine developed from the original Boeing 900 turboprop engine. The 932 weighs 184 lbs., has a single-stage compressor and two-stage turbine with a geared propeller drive. The engine develops 280 shaft hp, is at 42 in. long, has a diameter of 21 in., and a frontal area of 2.2 sq. ft.

Navy announced that it has been testing the Boeing engine for possible adaptation as a high-speed boat power plant. The Boeing 932, it is believed, has been considered the next to a large trailer truck as possible replacement for the conventional diesel engine.

The gas turbine has been under an extensive study by all three military services because of inherent engine plant simplicity. Navy lists advantages of the gas turbine over the conventional piston engine for use in helicopters because of increased simplification and field maintenance; lack of centrifugal clutch and cooling box; considerable savings in weight, and ability to operate on kerosene as well as with high octane gasoline.

Kamman has been awarded approximately \$106,000 for its gas turbine engineering program.

## Four Awards End Basic Pilot Program

Recent awards of four additional civilian flight school contracts by USAF for basic pilot training complete the present program of nine school contracts, but unsupervised bids will be kept on file at AMC for further reference, in event of additional expansion.

Four new schools will be opened by successful bidders in fall:

Anderson Air Academy, Milwaukee, at Milwaukee, Aug. 21.

Aerospace Associates and Southwest Airlines, both of Atlanta, at Roswell, Ga., Aug. 21.

Dart Air Transport, Inc., Chicago, at Milwaukee, Aug. 22.

South Air Inc., Raleigh, N. C., at Kinston, N. C., Nov. 9.

Four schools previously announced are already in operation in Illinois:

At Cottleville (Miss.) AFB, Gemline Airlines Co., Butler, Pa.

At Columbus (Miss.) AFB, California Eastern Airway, Inc., Oakdale, Calif.

At Spencer Field, Medford, Ga., Heselton Flying Service, Charlotte, S. C.

At Baturay Field, Fla., Gandy Aviation Co., Lakeland, Fla.

The ninth school will be opened July 9, at Rialto, Texas, by Texas Aviation Industries, San Antonio.

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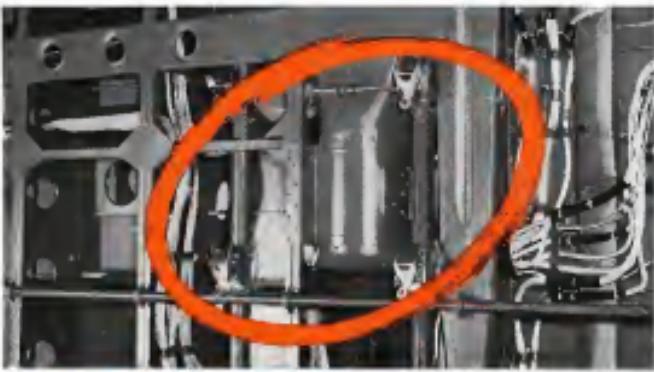
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## PRODUCTION



STRUCTURES ASSEMBLED in background, defense manufacturers' representatives look to replacement of new production techniques.

## Industry Views, Approves Optical Tooling

Demonstration of Republic method results in broad acceptance of principle, but differences on details.

By Thomas M. Bell

Republic Aviation Corp. demonstrated its optical tooling methods at the 852d Air Force Specialized Depot in Maywood, Calif., during a four-day industry-wide show, and this is what it proved.

The aircraft industry is universally agreed that there is a real future in optical tooling. But aircraft manufacturers want to experiment with their own ideas in working from the optical reference bar—whether it be a collimator, optical projector, wave refraction, or whatever.

Manufacturers consider the application of optics to tooling still in the experimental stage. They showed an inclination to "try" the Republic system whose significant points are set by the Universal Optical Standard. Most of them are not yet clear as to just what an accuracy which leads Republic and the Air Force hold dear to their hearts. The tooling experts concluded carbide carbure-type jigs do not have sufficient advantages for their applications at this time.

► **Big Time-Out.**—The industry-wide demonstration was concentrated in inspection fixtures for optical tooling. More than 200 tooling representatives from 32 companies attended, plus a considerable number of several dozen government. The industry-wide demonstration replaced the originally selected and invited, at the Lockheed and North American plants.

The overwhelming majority readily agreed the Air Force's 31 experts to get

get them once and had to buy off well pipe.

As for portability, you can build welded structures which can be taken apart. Lockheed is doing this now. They can be moved just as mobile and established assembly without difficulty and without disassembled fittings at every joint.

Some say that optics designed for breaking in can be cut apart and remade. You do it by building a machined part before cutting, using precision rigs with separate spacers. North American did that on A-7 jigs and to Colenberg.

► **The Important Thing.**—Adolph Kirschbaum, Republic's chief tool designer, said in summation at the end of the conference: "The important thing is to use optics to set measurements. Optical should be used to set the measurements. He said that the little tools all give a good job. It is a question of what is more effective.

F. Schwartz of Lucas Equipment Co., Chicago, add: "Aerotech Wires," "I don't know any of the substitutions for Republic's perimeter are going to surpass it. All of these [the manufacturers] say they are going to make one, but I don't think they will."

► **The Money Angle.**—Manufacturers were very cool and cautious regarding clamp earnings. Kirschbaum replied that cost data is difficult to prove. But he observed that you couldn't make the cost off in a year or two, even though they are much away as welded structures.

Furthermore, you aren't limited in use of jigs. Lockheed used welded fittings in the last, Bell said, but couldn't i

(Continued on page 24)

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*Optical Tooling From Coast to Coast . . .*



UNLOADED FROM C-130 FROM REYNOLDS' PLANT IN NEW YORK, BEFORE IT . . .



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REFERENCE LINE = right in assembly in California with duplicate that in New York



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for a unique  
airborne duster

BILL

Courtesy: Bill Aircraft Co., Buffalo, N.Y.

The use and value of S.S. White flexible shafts in a means of driving aircraft accessories is surely demonstrated in the crop dusting biplane shown above. The shaft transmits power from the flywheel gear box to an impeller-type pump which drives the insecticide to the spray nozzle. Can you think of a simpler, more effective way to do the job?

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KASTELOWITZ: The principle is the same.

factors wouldn't have to carry big stocks.

Kastelowitz and Republic won't use saggers exclusively, but that sagger makes up good factors and, they say, is good design and they help eliminate vibration.

► **Verschneid-Niederschleifer**, Germany, were pretty well sold on the Tegla-Holzen and other British optical equipment. But they all have different methods of setting vertical measurements and removing lateral distances.

► North Americans think it might combine optics with an auto positioning base to obtain level measurements.

► **McDonald Aircraft Corp.** is working out a method of using accurately mounted tubes in place of the positions to obtain measurements of the reference line.

► **Lokholt Aircraft Corp.** was the auto-reflection and drift base target arrangement to tilt fittings perpendicular to a line of sight. Lokholt claims the use of auto-reflection is a valuable tool to optical tracking because of the very great accuracy that can be obtained, the ease and speed with which good results may be produced and the very small size of the auto-reflection target because makes it applicable in so many places that are inaccessible to the T-31 collimator, or other means of locating to eliminate displacement and tilt.

Lokholt claims a photographic method to obtain orientation along the basic line of sight. This is Lokholt's present development, following experimentation with extended auto-reflection, physical properties from a tracking bar. Basic station layout on the job frame and laser station pin hole location on the job base.

The station combines physical means

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Since 1938...  
PLEXIGLAS Has Kept Pace

PLEXIGLAS samples, nose and windows on the Boeing B-57A. Coming, nearly 10 years later, is the aircraft shown here with PLEXIGLAS II. Fabricated by Development Aircraft Company  
Photo: Roger Henn, Western Newsphotos  
Ref. P-222

From its use as a landing light cover on the nose of a globe-circling plane, to a position as aviation's standard material for transparent enclosures and windows—PLEXIGLAS has kept pace with the industry's rapid growth.

In 1936, when Howard Hughes took off on his flight around the world, PLEXIGLAS rode with him—shielding the landing light in the nose of his Lockheed 14. It was a dramatic use of a new material. Within less than two years, Bakes & Haas had developed methods of producing and forming large PLEXIGLAS sheets for airplane enclosures, and helped make possible the improved aerodynamics of the planes of 1940-50.

Today's planes, too, PLEXIGLAS is the standard transparent material. With improved

heat resistance and solvent-solvent erosion resistance, PLEXIGLAS II meets rigorous Army-Navy specifications for current high-speed, high-altitude aircraft. And the present trend toward laminated enclosures on combat planes is possible because of the adaptability of PLEXIGLAS to the necessary laminating and bonding techniques.

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PLEXIGLAS landing light cover on nose of Howard Hughes' plane-circling Lockheed 14. Hughes' record-breaking flight brought dramatically the field of aircraft design and performance.



and optical instruments to determine measurement of length. Lockheed uses a beam set of a pentagonal prism as an optical system with a position bar. Both are clamped securely at fixed intervals to the bar and projected by lenses to the eye.

The use of the pentagonal prism allows for a great deal more latitude in aligning the optical system to a line of sight with out incurring any appreciable error, Lockheed says. In other words, the "strip error" using a triangular prism instrument is compounded by the distances involved, but the error of setup of a pentagonal instrument is the same at two feet as at 40 feet.

►Thoughts for Bending—Thus was unavoidable interest in the Lockheed system. Many tooling engineers thought they might be able to make some use of it in conjunction with the Republic and their own particular tooling tricks, particularly the use of the prisms prior to completion with a position bar. They were also excited about Lockheed's sample methods in developing optical systems without expensive or complicated equipment. One example is Lockheed's use of a bath buck target instead of a collector.

It was concluded that the difficulty in the Lockheed system is getting accurate parts gross.

A common complaint about optics generally was that they do not hold precision at distance measurements. The thought of a beam system might tell all of us to approach this to our problems by road instead. One other solution is to be on the marks as a precision steel tape held under constant tension.

►The Tooling View—Here are some comments by tooling people present at the Air Force demonstration:

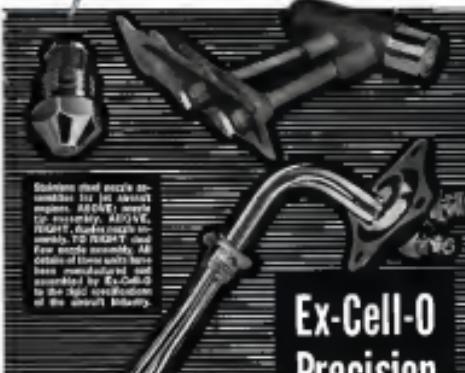
Letham Pollock, tooling spokesman at North American, said, "We are really just observing today. Optics is brand new to us. If the Republic system (certainly) certainly gives a great reliable baseline, it would be ideal for us to get and begin. Set the Universal Optical Processor. It's going to be one way to work in mass production."

Pollock went on to say that the main thing the manufacturers will consider is adopting optical tooling is the cost. He pointed out the Air Force is not going to allow any more money for optical tooling. Therefore any system of optical tooling must be competitive in costs. "Nobody wants to spend more for tooling than he has to. You can't sell tools."

Another North American spokesman and his company "was not ready to do the Republic system as the ultimate in tooling."

A representative from McDonnell said that on a new contract he can prove he is holding two square sets of tooling, one for optics and one conventional so as not to hold up production

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## AVIONICS

### Design Trends in Buried Antennas

With more and more avionics using more and more antennas, engineers devise intriguing installations.

Rapid increases in the amount of air force avionics equipment have produced many changes in the antenna design of fast aircraft since the second World War. The first tendency was to "Christen" the aircraft by keeping an antenna externally wherever space could be found.

But jet aircraft speeds imposed new structural loadings on external antennas, so nothing of the overall configuration was done in incisor. More and more, designers began seeking the ways to make a stronger, lighter-weight antenna.

They found the answer in the idea of "buried" (or "internal") antennas, where the entire antenna or its necessary hardware is enclosed within the structure of the aircraft. Progress in this new antenna design field has been rapid. And some of the advances have told recently at the second airborne electronics meeting of the Institute of Radio Engineers.

Following is a roundup of some of the significant points made by several authors in papers presented at the meeting. Taken together, they present a basic approach to the understanding and practice of stabilized antenna design.

► **Basic Two-Element System.** In aircraft there have been three basic types. These can be subdivided further by definition and function.

► **Communication.** These are two half-space horn, long-wave (bass) and short-wave (treble) - long-range communications are generally of the half-space type; short-wave are either horn or slot, such as in corner locators, or as a requirement, such as in ground-control transmitters.

► **Navigation.** There are two subgroups here also: terrestrial reference systems and target reference systems. The latter is generally a long-range navigation system of moderate accuracy, such as Loran. The former is short-range, precision system typified by homing-in on target homing beacons.

► **Target acquisition.** This heading would include all systems which locate and vector the aircraft to a specific target such as an enemy plane or a friendly aircraft carrier.

► **Frequency Range.** The frequency range for systems which have been developed in the choice above varies from 30 hertz to 30,000 megacycles. For convenience, this entire spectrum is divided

into low, medium-high and ultra-high frequencies. The division, naturally, is not standard, but the band width is marked by "Y" cycles at the low end and "Y" cycles at the high end. Rather, it makes the division a compromise of the dimensions of the structure and the wavelength.

In this manner, low frequency covers the range where the maximum complex dimensions are small compared to the operating wavelength. At medium high frequencies, wavelength and antenna dimensions are comparable. And at ultra-high frequencies, antenna dimensions are large compared with the operating wavelength.

► **Low Frequency.** The primary use of low frequency systems is found in immediate and long-distance navigation aids: Loran, radio range and radio radio wave compass. Vertical polarization is generally used to avoid the large ground attenuation common to horizontally polarized fields.

Such vertically polarized, low-frequency transmissions give strong ground wave signals out to distances of several hundred miles. These is the disadvantage that no typical test frequency is available, and the magnetic noise level is high in this frequency range.

The magnitude of the noise level due to atmospheric static is such that increasing the effective height of a receiving antenna does not improve the signal-to-noise ratio. This implies that a short antenna gives performance almost equivalent to a very long one if typical static, antenna lengths of one or two meters are substituted.

Atmospheric, low frequency, antenna is done like an ordinary dipole. Consequently, the design problem becomes one of getting the proper orientation of the maximum power so that an effective vertical component is obtained for vertical polarization.

In the case of the trailing wire antenna, for example, the dip of the wire causes it to tilt at a very small angle with the horizon at constant flight speeds. At 300 knots, the angle is about what less than 4 deg. This means that the standard Air Force trailing antenna at 200 ft. length shows an effective height for vertical polarization of only about two meters.

► **MBB Problem.** This band is taken to be from about 2 to 24 megacycles for typical interests. One characteristic of



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these systems is that distances between aerial and distant antennas range from 200 to 1,300 m. Thus, the ground wave signal is impeded as compared to the signal transmitted by way of the atmosphere.

Polarization of the receiving antenna at the receiving field is unimportant, since signals in this frequency range undergo a variable and variable rotation of polarization when they are reflected from the earth.

One measure of the antenna system efficiency in the medium high frequency range is the product of radiation efficiency (ratio of power radiated to total power radiated) and power transfer efficiency (ratio of power radiated to power developed in transmitter output tank circuit). Radiation efficiency ranges from 50 to 60 percent at lower frequencies, to 20 percent at the higher, power transfer efficiencies can be as low as 10 percent, even less than 10 percent. Generally, then, the antenna system efficiency would range from 5 to 15 percent for typical wire antenna systems on the craft.

► **Ultrahigh Frequency**—Typical systems operating at these frequencies would include command transmitters (e.g., ILS, DME, VOR), radar beacon and absolute altimeters. Propagation distance is limited to several miles, which in the case of radio-to-control systems can be as great as 500 m., and for ground to air as 100 to 500 m.

UHF reception is affected by interference phenomena from atmospheric propagation. The reception can be improved if the reflected wave meets the direct wave from the transmitting antenna, and amounts to a different pattern in a vertical plane. Correspondingly, a plane flying toward a ground station from a great distance will receive a signal lead that rises and then fades into noise cyclically as the craft descends.

In the air-to-air case, a similar effect occurs, complicated by a dynamic effect. If two planes close to each other at a high rate of speed when communicating, the dynamic interference becomes more and reflected signals produce both phase and amplitude modulations of the carrier. These modulations frequencies can be in the radio range, and thus produce a high noise level on the distant modulator.

Circular polarization and highly directional antennae have been suggested as means to avoid the interference of UHF signals, but both systems have disadvantages.

► **Speed a Problem**—In addition to these propagation characteristics, which seem to be inherent in the antenna systems, another problem has posed a new set of problems. For instance, an 800-mph jet craft will had a 230-ft. wide antenna

Nar will it use any exposed winds or use antennae to create additional drag. Consequently, there has been much interest in and increasing use of stepped antennae, where the antenna is completely submerged within the airplane's body.

One of the most useful versions of the airplane for the location of these antennae is a vertical tail. Thus, an antenna can be used as an aerial in the case of Lorenz equipment) or to mount other antennae for UHF operations.

In one particular installation (based on a modified Douglas C-54D), the upper seven feet of vertical tail was completely insulated from the rest of the structure by a wave, gap. All the structural elements in this insulating section were replaced by parts of Fiberglas which included with a special resin.

In this system, the insulated surface of the vertical surface was used as the antenna. The antenna conductors of the vertical tail, and antenna, were used for Lorenz reception. The UHF receiver subsections all operated at above 100 mcs and were in the form of dual flat-mounted radiators located in the upper surface of the fin.

► **Flight-Cap Antennae**—In the case of the Boeing B-47 Stratojet, it was necessary to develop a dual Loran antenna which could be integrated into the surface without major refitting of the craft.

Investigation of several possible configurations for the antennae led to a location of the plastic fin tip insulation in the direction of the aircraft's longitudinal axis.

The insulation was removed, the reflected wave was met by the direct wave from the transmitting antenna, and amounts to a different pattern in a vertical plane. Correspondingly, a plane flying toward a ground station from a great distance will receive a signal lead that rises and then fades into noise cyclically as the craft descends.

Development proceeded with the final design resulting from a wind-tunnel procedure, aimed at optimizing antenna capacity and effect of wind without appreciably affecting the VOR antenna. The result was that it was necessary for the Loran antenna to share the fin cap with the VOR antenna.

Final investigation of the antenna as an inverted "L" with the leading section made of an aluminum shell riveted onto the Fiberglas cap. A plastic phenolic base down-holds complete the assembly. Physical dimensions of the antenna are 65 in. by 13 in. Effective antenna height was one meter.

One concern of the designers was the propagation static induced on an aircraft personnel. The antenna, when the antenna is located in an area of high electric stress. But the new design does not allow static discharge to have increased noiseless effectiveness.

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# How EDISON Indicators Save 35 Pounds



Below: Standard resistance temperature indicators were recently specified for cylinder head indicators in a new type of four-engine transport. In this installation, two dual indicators and eight bulbs were used...at a weight savings of 35 pounds) under the thermocouple system formerly employed.

Weight reduction is only one of the many features associated exclusively with Edison indicators. Of special interest to maintenance engineers is the ability of Edison indicators to adapt themselves to any temperature measurement application. The Edison indicator movement is standard for all indicators whether used for cylinder head, oil, air, bearing, etc., etc. This consideration permits the temperature range in any given indicator to be changed easily by substituting a new dial and a few low-cost resistors.

It will pay you to investigate this proven way to save weight and cut maintenance costs. For complete information on indicators, send for our new Bulletin #5925. And for matching temperature bulbs, ask for Bulletin #5916.

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INCORPORATED

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and so it is anticipated that the signal-to-noise ratio will be equivalent to other locations on the airplane. In addition, the fan cap has been tested with a conducting plate to prevent charging of the plate with respect to the aircraft.

► **Wing-Tip Antenna**—One of North American's jet fighters (presently a modified F-100) was the subject of a development program which evolved an omnidirectional range antenna built into the left wing tip. Some previous flight tests on a light plane had shown that such an antenna provided adequate omnidirectional wave reception in ground areas.

Of course, the antenna had to be light in weight and have assembly and fabrication techniques adaptable to production. A further requirement was that the antenna be such that the antenna could be assembled on a bare boom with out post-assembly tuning adjustments.

A radiation pattern study was made, using a one-tenth scale model of the plane. Model was made of wood, with an undercut at one apex to fit the fin fairing. The final cost was \$100.

The model study showed that the omnidirectional gain (relatively omnidirectional pattern, subsequently, a full-scale model of the left wing was built. The antenna extended about 14 wavelengths from the antenna. It was made of wood beams covered with tissue plate with solidwood posts.

Several models of a shafted element were investigated, being, flat strip and bar stock wire among those tried. The final choice was a flat strip of 24 SD aluminum alloy. A plastic support was used near the left end of the reflecting element, and the capacity load of this support and the Phelon glass fiber was 4 pounds to shorten the antenna several inches.

► **Door-Lip Antenna**—Another variation of a omnidirectional antenna on a North American jet fighter was developed around a pilot-seat antenna. Investigation was made of a cavity antenna located in the leading edge of the seat belt lever lip.

Some design requirements of weight, fabrication and no postassembly tuning held for this antenna as for the wing-tip antenna. And again, metal and full-scale tests were made along the developmental steps.

Early developmental steps in the antenna design were made which included the fabrication of a half-cylinder cavity resonator and one-quarter elliptical shaped. After experiments with this, one prototype antenna was constructed which was found to be very similar in electrical properties to the developed magnetostatic soft ferrite.

After the cavity resonator has been mounted in the lip, a Phenolic cover is placed over the cavity opening, and



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# Freedom and Progress

It's no stretch of the imagination, either, robust realism to call our past half century a Miracle—U.S.A.

America has set an amazing record of progress in 50 years—but a moment in the history of civilization. A record unequalled by any other political or economic system.

Merely by broad brush strokes, we can all visualize this miracle. Remember the crystal set, the hand-cranked car, the big ship? A far cry from our FM radio, television, hydro-electric drive and supersonic planes.

And here's another phase of the miracle that went hand-in-hand with these and the myriad of intertwined technological advances—ranging from the radio telephone and Bakelite to the X-ray tube and teletype... and to atomic energy and its untold potentialities,

- ★ Since 1930 we have increased our supply of available power 45 times.
- ★ Since 1930 we have more than doubled the output each of us produces for every hour we work.
- ★ Since 1930 we have increased our annual income from less than \$2600 per household to about \$4000 (in dollars of the same purchasing power), yet...
- ★ Since 1930 we have cut 15 hours from our average work week—equivalent to two present average workdays.

How did we do it? The basic cause for this composite miracle has been the release of human energy through FREEDOM, COMPETITION and OPPORTUNITY. And one of the most important results is the fact that more people are able to enjoy the products of this free energy than in any other system the world has ever known.

THIS IS THE MIRACLE OF AMERICA . . . it's only beginning to unfold.

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listened to in the skin of the aircraft. The cover has a slight capacity shortening effect, and the prototype antenna was designed for best results with a fiber glass cover.

The final model of the glide path cavity and fiberglass cover was built by NAA using aircraft production techniques. The cover is a molded part, and is sprayed with Gaco compound to obtain a smooth surface.

These typical examples represent our steady thinking and practice in the field of aircraft designs for high-speed aircraft. Such advanced craft as the de Havilland Comet and the Avro Jetliner have completely suppressed intense vibration. And these kinds of aircraft will be built in greater and greater numbers to the aircraft designer as its airplane speeds go higher and as aircraft equipment increases in scope and power.

The above report is based on a group of papers presented at the second annual air losses reduction conference of the Institute of Radio Engineers recently held at Detroit. Other should be in the group.

"Rotor Counteraction in Aircraft Army Design," by John V. N. Giansanti.

"Vertical Radiation Antenna System for Multiple Questions," by R. Erdmann, J. T. Sollner, A. R. Egle and D. S. Schreiber.

"A Long-Range Dual-Beam Antenna," by Gerald W. Johnson.

"A Wide-Band Counterrotating Range Antenna for a Jet Fighter Aircraft," by James G. Martin.

"A Glide Path Cavity Antenna in a Jet Fighter Aircraft," by Louis E. Roberts.

## Fault-Finder Spots Electrical Defects

A V.R. Bus Canada Ltd.'s Jetliner will be equipped with a fault analyzer for spotting defects in the craft's electrical system.

When a fault occurs in an aircraft's electrical system it is usually difficult to determine exactly at what point the fault is located, notwithstanding voltage failure. Frequently this results in a system being switched off when only a minor fault has occurred and has not rendered it irrecoverable.

With the fault analyzer the flight engineer or ground crew can quickly spot the nature and location of the fault, assess its significance and take measures to isolate or repair the defect or ground it, if necessary.

Arrangement of the analyzer includes

a group of warning lamps on the flight engineer's panel, a voltmeter, ammeter and a switch for the analyzer. In which phase of the alternator it has occurred.

If the voltage drops suddenly in one

of the circuits, it causes de-energization

of a relay connected from the affected

phase line to ground. This causes a set of contacts to close, lighting the appropriate light.

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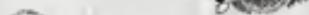
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377 "Stratojet"



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North American P-51, \*



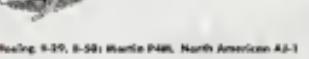
Bacchus B-50/ Beach 37; Grumman UF  
Lockheed P-38; Morris 102, P46, P50c

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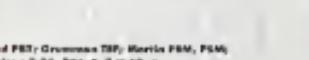
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Racing: B-39, B-58; Martin P-46; North American A-1



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North American B-33, P5A, Bell X-12, \*

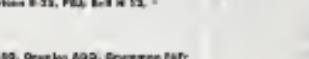


MODEL 616  
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520 SERIES  
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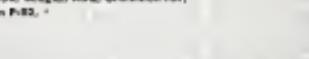
Koehl 10, Bell H-12; Cessna 170, 180, Ryan "Harvest";  
Sikorsky H-33-Power Pack Preheating



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570 SERIES  
20,000 BTU/HR

Koehl 10, Bell H-12; Cessna 170, 180, Ryan "Harvest";  
Sikorsky H-33-Power Pack Preheating



MODEL 612  
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### Agricultural Plane Accidents

(Injuries and Deaths, 1949-1951)

#### COLLECTIONS WITH OBJECTS

1949 1950 1951

Year	Plane	Deaths
Total	10	10
Severe	9	12
Minor/None	65	34

#### Types

Plane	Deaths	Severe	Minor/None
Total	12	6	24

#### Buildings

Plane	Deaths	Severe	Minor/None
Total	4	4	4

#### Boats

Plane	Deaths	Severe	Minor/None
Total	17	12	12

#### Other Objects

Plane	Deaths	Severe	Minor/None
Total	4	3	4

#### Still in Air

Plane	Deaths	Severe	Minor/None
Total	15	14	15

#### Other Type Machines

Plane	Deaths	Severe	Minor/None
Total	4	3	4

#### GRAND TOTAL

Plane	Deaths	Severe	Minor/None
Total	65	58	287

Source: CAA Annual Accidents

went in all directions except through the wings. The cockpit facing is no wider than his head, so he can comfortably look back to his field before raising his head to return for gasoline.

He specified a flat plane in favor of wings, so that the airplane would easily fit into a comfortable cross-country flight. CAA Fl. Worth aircraft division chief C. W. Van Rosenberg last fall arranged a trip to the west while bringing the plane from Texas to Washington for the demonstration.

Controllability—Pilot Van Rosenberg told AVIATION WEEK that the Ag 1 handles beautifully at speeds right down to the stall, flies up or down, left or around. 35-40 mph. CAA and other pilots have put it through all "qualitative" evaluations—stalls, turns, etc.—and have not yet found any faulting on its roll, pitch, yaw, roll and other flight requirements, and other desired operation statistics.

This will come after the normal permission and evaluation tour. CAA Administrator C. F. House says on permission is for early certification of the plane after the tour. The tour will continue about as long as groups will, in case CAA will need it anywhere within season.

The full Ag 1 sets slow as an albatross. And when lips are down, the sleek sleek aircraft looks comical, but it flies correctly. But, says CAA, the Ag 1 flies like a plane with slot flaps down only (flat aileron stations) and had about too much control. The slot flap when up acts as a spoiler of lift over the top high lift flap.

• **From Europe**—This plant probably has the largest wing in use. It holds the spray tanks and equipment and provides exceptionally high lift at low speed. Spraying system is thus built right in along whole length of wings, giving maximum distribution. The prototype new type has not yet had its first dusting experiments, but it is. That goes in the fall, the winter, the spring. The engine runs at least of the pilot.

All metal construction, carries long life without breaking, maximum resistance, and safety.

For use in built into the plane in every practical way the designer could fit. That was a principal aim. Safety, durability, and controllability are vital to farm utility.

• **Small-HP Performance**—While CAA has not yet run complete performance tests of the Ag 1, distance required, the plane designed for takeoff of 1,200 ft. Van Rosenberg says the plane seems to make it in about 1,200 ft. with no wind.

Some observers at the Washington demonstration commented that more power would not be used. Present unit

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**SELECTORS**

**ROTARY SOLENOID**  
**OPERATED**



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the phone wire left without its cutting the line.

• **Visibility**—The pilot of the Ag 1 sits high in an open cockpit. He sits down



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It is a 225 hp engine donated by Continental Motors. While the plane is not "under-powered," many customers of today may want the plane more powerful. Von Rosenberg says that a 250 hp geared Lycoming would be a good one to use. The 250 hp Lycoming would cost and sell originally up to the \$40,000. Part 6, Whiteman model which, though definitely not needed, would give the plane Super-Cruise take-off and climb.

### Icing Protection

Aero Canada's Jetliner icing trials have been conducted with new circumferential leading edge rubber striping that combines antiicing and deicing features.

The electrothermal equipment, manufactured by Goodyear Aerospace & Rubber Co., is a circumferential rubber striping housing protective elements. A step along the nose of the leading edge is heated continuously to prevent icing. Intermittent heating is applied to the bottom of the rubber striping during all on-top and bottom. This cyclic heating prevents a small amount of ice accumulation, which is heated loose periodically. The operation is designed to prevent water run-back and freezing on the unprotected aft surface of the wing.

By having the heat pressure drop for a given boundary condition, such as some particular thickness ratio or structural requirement.

To alleviate the theory, calculations are made using the equations of incompressible inviscid flow. The results show that:

- Optimum strip profile provides free blunt trailing edge.
- Optimum thickness distribution depends only on one dimensionless parameter involving Mach number, solid thickness ratio and heat pressure coefficient.

Pressure drop calculated for the optimum profile is compared to that of a however, sharp trailing-edge profile which creates the same thickness is, however, the reduction in pressure drop depends on the heat pressure coefficient and the heat pressure coefficient is at most 75 percent.

A caution note suggests that care is used in applying the quantitative results, since the rule is concerned only with passive drag.

Results can be directly applied if the skin friction coefficient is insensitive to small changes in profile shape (such as in turbulent flow at high Reynolds numbers) or if the function is small compared to passive drag (such as with thick airfoils).



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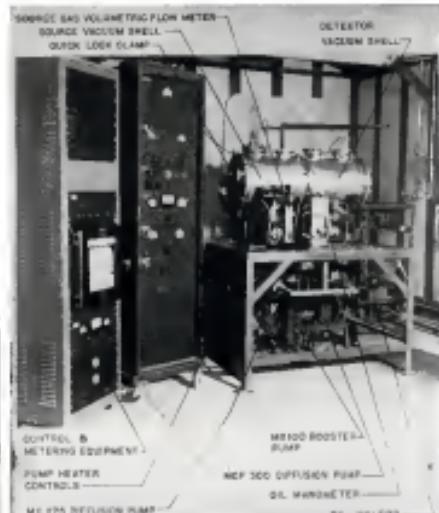
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SUPERFLUIDYNAMICS, high altitude flow phenomena, is studied in this "windtunnel".

## New Way to Study Altitude Flow

A new supersonic windtunnel intended to replace the properties of air at simulated altitudes of 50 to 250 miles in ground test operation at the Berkeley campus of the University of California.

The new test device uses a molecular beam similar to the type used in nuclear research. Speed simulation to date has been limited to a 100 reyns value, although greater capabilities have been demonstrated.

Funds from the Office of Naval Research and the Office of Air Research were used to build the tunnel, which was designed to extend the range of the university's low-pressure, supersonic windtunnel, the world's first to be capable of test conditions simulating air high as a 75-mile altitude.

The main component of the "tunnel" is a stainless steel tube about five feet long and 18 inches diameter. Auxiliary pumps and reservoirs complete the apparatus.

By Definition - Supraviscous

flows occur at extreme altitudes—of the order of 100 miles—where the air density is very low and the molecular mean free path is long.

The molecular mean free path is the average distance traveled by one molecule between collisions with other molecules. At sea level (standard conditions), the mean free path is about three sixteenths of an in., at an altitude of 90 miles, the free path is about 10 ft.

As it happens, an altitude of about 75 miles marks the lower limit of the appearance of supraviscous flow; at the 100-mile level, almost any vehicle would be in such flow. A further conclusion is that the flight Mach number must be greater than the flight Reynolds number. However, there is no reason why the Mach number couldn't be set this low in order to study supraviscous flow.

For flight at the upper limit, the vehicle can be considered to be flying against a molecular beam, in which the effect of collisions between air molecules can



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# TEMCO Rated High in Quality Control

## All Production Processes, Testing Methods and Laboratories Have Top Rating

Strict administration of Quality Control has played an important part in TEMCO's progress in the engineering and manufacture of aircraft. The procedures, methods, and equipment used at TEMCO's plant are recognized by the Navy and Air Force, certified by the Government, or licensed by the Civil Aeronautics Administration. Above everything else, the men who use these procedures, methods and equipment possess the one quality for which there is no substitute—experience. Of all the men now employed in the TEMCO inspection department, more than 45 percent have from 7 to 22 years actual aircraft inspection experience to their credit, while another 35 percent have from 5 to 7 years.

### Quality Control Starts With Men in Shop

Hanging on the wall of a TEMCO Production Superintendent's office is a sign which reads:

**Quality Must Be Built Into a Product—it Can't Be Inspected Into It!**

These words could well be called the motto of TEMCO's production departments, for the men in the TEMCO shop know that it is they—the mechanists, the riveters, the installers, the assemblers and the men on the shop floor—whose work is responsible for the ultimate quality of TEMCO products—*not* the inspectors.

To those men the respective is important not as a source of quality, but as a guarantee that each part and assembly has the quality which only they—the men who built it—can put into it.

### TEMCO Building Major Assemblies for Martin

Work is getting under way at TEMCO on major assemblies for the PBM-1 Martin Flying Boat manufactured by the Glenn L. Martin Company of Baltimore, Md. The Martin is one of the Navy's most modern patrol bombers, a successor to the PBM series made famous during World War II.

# TEMCO

ENGINEERS AND MANUFACTURERS  
FOR THE AIRCRAFT INDUSTRY



**QUALITY CONTROL**  
BACKED BY  
**245,440 MAN HOURS**  
OF  
**INSPECTION EXPERIENCE**

### From Receiving to Flyaway

From the time the raw stock entered the TEMCO plant to final flight test as part of a completed airplane, this one forging benefited from eleven different inspections—Receiving, Zinc, Tooling, Machine Shop, Heat Treat Processing, Paint, Installation, and Final Acceptance by Flight Testing.

Performing the inspections on this one part were inspectors whose cumulative aircraft experience totals 118 years or 205,440 man-hours.

This is not an exception, but a typical example of the strict inspection procedures applied by TEMCO, and the experience which TEMCO has available to insure their proper application.



Texas Engineering and Manufacturing Co., Inc.

DALLAS, TEXAS

is neglected. These materials to make coil solenoids were very seldom compared to one another between the materials in the coil body.

#### ► Tunnel Atmosphere

The hypobaric hypoxia-weathering test was more like a gas mixing molecule bath.

The storage of molecules is held into an encircled chamber from a small hole which has an opening at one end. The nozzle velocity is determined by the temperature of the fanjet, at 1,000°F, the speed is 1,880 mph.

A system of slots controls and forces the molecular beam to strike against small sections on the chamber.

Atmospheres in the low-density level comparable to normal atmosphere take a week of continuous operation in a hypobaric hypoxia weathering test. Part of that long pumping cycle is attributed to the adoption of air molecules on the metal parts of the tunnel. This reason also accounts for the adoption of rubber as a gasket material, rubber loses up to 10 percent of its volume when placed in a vacuum system.

Simple and complex problems in instrumentation are introduced by the operation of a windmill where working pressure is one twentieth of an inch level pressure. In order to detect pressure differences in such a low-density medium, very sensitive gauges must be used. One electronic electronic gauge developed at the Langley can measure pressure changes of one part billionth of a sea level standard atmosphere.

► Slightly Supersonic—So far, the test aircraft speed has been only slightly supersonic—570 mph is the quoted speed. But it has been determined that speeds of 1,500 mph can be attained, and the upper edge of speed is only limited by the temperature that the nose chamber can stand.

The work of developing this new tool was directed by Prof. R. G. Fisher, professor of mechanical engineering, S. A. School and head of engineering school; and G. J. Stalich, supervising engineer. Coordination of the operation of the tunnel was under the supervision of R. C. Harbeck, physicist.

### Power for Starting

All research Mfg. Co.'s 140hp low pressure air turbine starter has just recently completed Air Force testing.

Reported to be the most powerful air starter ever developed, the 32-lb unit is said to have enough muscle to turn over turbines in the 10,000 lb thrust class and turbines in the 30,000hp category.

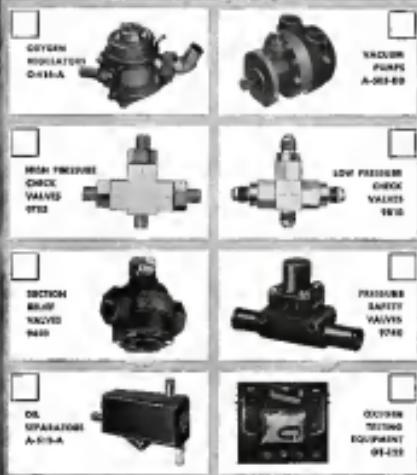
Administrators say that at the end of the testing, just completed in the equivalent of six months of service as an operational aircraft-turbinepower unit has dropped less than 1 percent.



**PRECISION Aircraft Products**

built with years of know-how!

► CHECK YOUR NEEDS!



**AIRCRAFT PRODUCTS**

WITH... THE TOOLS... THE ENVIRONMENT  
GEAR FITTINGS

## EQUIPMENT



FLAME shoots out more than ten feet when standard hydraulic fluid is fed under pressure into these of oxyacetylene torch at right.



NO FLAME erupts when new hydraulic fluid H-2 is forced under same conditions into same torch. Very few is using the fluid.

## The Hydraulic Fluid That Will NOT Burn

Hollingshead's H-2, being adopted by Navy, is rated by CAA with Flammability Reference Number of 0.

By George L. Chardan

Canons, N. J.—A thin flexible hydraulic fluid that can be sprayed under high pressure into the 8,300 deg flame of an oxyacetylene torch without catching fire has been developed by R. M. Hollingshead Corp., and will be used in the hydraulic system of every airplane the Navy wants to purchase.

This truly remarkable fluid, which sets fire good laboratory and is, we cer-

tainly, a named H-2 and now is being made available for all commercial and military aircraft, says Frederick H. Lee, Jr., Hollingshead sales manager.

► **Will Not Burn**—Here's a proof of H-2's non-flammability. A Civil Aeronautics Administration test report states that when H-2 under 6,000 psi was sprayed through an oxyacetylene flame (temp. 8,300 deg F.), no fire resulted.

George W. Hollingshead, CAA's Chief Aircraft Division, gave the fluid a Flammability Reference Number of 0, based on tests by CAA Technical Development & Evaluation Center, Indianapolis. Practically encasing the fluid for fire protection, even with all the water boiled off, each quart of the reader is 763 deg F.

Navy planes now flying are having these hydraulic systems designed, floated and filled with H-2. Almost all aircraft for the Navy now on the production line will have their systems filled with H-2 as will most future Navy craft.

A significant advantage of H-2 is that it does not require changing hydraulic rubber seals or leather leather rings, nor of any other hydraulic system

*The  
Most Trusted  
Skill on Earth...*

Suppose for a moment that you found it necessary to choose a surgeon to perform an important operation on you or a member of your family—how would you select the one man in whom you could place such a trust? In all probability you would arrive at your final decision only after a careful check of his background, his qualifications and professional experience. The same logic can be used as a guide to important decisions in other fields as well. A case in point is your selection of a source for the vital components and accessories used in your plane. Look at Eclipse-Pioneer's record in this field. It dates back to the aviation industry's earliest days. Right from the beginning Eclipse-Pioneer has consistently demonstrated its ability to design and manufacture to both military and civil specifications, for experimental as well as operational applications. In addition, Eclipse-Pioneer maintains and maintains a system of quality controls so precise that they have become literally the standards by which the "restored" are checked. *After this in mind, it's worth remembering, for when you choose as the raised above, you will inevitably call on Eclipse-Pioneer.*

**ECLIPSE-PIONEER**  
TETERBORO, NEW JERSEY  
Division of  
Bendix  
AIRCRAFT CORPORATION

## BLAIR CHOOSES LEAR FOR RECORD FLIGHT OVER NORTH POLE

# WESTERN UNION

LB242 51A71B SHWB03 IN TO  
PORT WASHINGTON NY JUN 5 1961

LEAR INC. WILLIAM P. LEAR  
THANKS TO THE WONDERFUL PERFORMANCE OF YOUR L-2 AUTOPilot,  
YOUR ADF-12 AUTOMATIC DIRECTION FINDER, AND YOUR VHF  
COMMUNICATIONS RADIO, MY FLIGHT OVER THE NORTH POLE WAS  
ESSENTIALLY NO DIFFERENT FROM ANY OTHER ROUTINE FLIGHT I  
HAVE MADE EXCEPT THAT IT TOOK A LITTLE LONGER. THE L-2 TOOK  
CARE OF ALL THE CRUISING FLIGHTS AND THE ADF-12 WAS EXTREMELY  
HELPFUL IN THE NAVIGATION BY OBTAINING LONG DISTANCE RADIO  
BEARINGS FROM ALASKA. I HAVE OPERATED YOUR EQUIPMENT ON MY  
MUSTANG UP TO 37,000 FEET AND AT TEMPERATURES OF 20 DEGREES  
B BELOW ZERO WITH UNIFORMLY EXCELLENT RESULTS. BEST REGARDS—  
CHARLIE BLAIR

From Newark to New York via the North Pole with only one stop. For just 15 hours, Alaska—6,700 miles in a Mustang P-51 at an average speed of 300 miles per hour—that is the historic and daring achievement of Captain Charles E. Blair, the only man ever to make such a flight solo over the top of the world. In the Arctic regions poor magnetic compasses useless, or you radio direction finding aids and extensive pilot become all important—particularly when you have to go alone. Captain Blair, Steinbrenner pilot for Pan American World Airways and captain of 500 Atlantic crossings, knew exactly what the

job called for. Naturally he chose Lear equipment throughout—and he was successful in doing one minute off his ETA's on the entire flight.

Here is the Lear equipment carried by Captain Blair for his remarkable flight—all the in one specially instrumented P-51. It had to be compact to fit the aircraft had to be painted to do the job.

- 2 Lear ADF-12 Automatic Direction Finders
- 1 Lear L-2 Automatic Pilot
- 1 Lear Multi-Direction Indicator
- 2 Lear VHF Radios
- 1 Lear Medium Frequency Receiver
- 2 Lear Instrument PAF Transmitters
- 3 Lear Low Frequency Transmitters
- 3 Lear Identified and Telemetry Antenna Assembly

**LEAR INC.** 1010 NELF FINE BLDG., LOS ANGELES 45, CALIFORNIA



## SIZE OR WEIGHT



## NO PROBLEM FOR

# Flying Tiger Air Freight

A single Flying Tiger Liner takes only load up to 20,000 pounds... and Flying Tiger has 33 special air freight liners, on multi-city schedules, that carry anything from salaries to engineering instruments to telephones. Because... Air Freight is a lot cheaper than Express and as fast or faster. In many cases Flying Tiger rates are lower than Rail Express. And there are 10 additional ways you can save with Flying Tiger Air Freight. For full information and our freight analysis of your products, call your nearest Flying Tiger representative or write direct to Flying Tiger General Office.

**FLYING TIGER...**  
a better way of shipping,  
a better way of buying,  
a better way of selling,  
anywhere, any time, anything.

**The Flying Tiger  
Line Inc.**

GENERAL OFFICES  
LOS ANGELES AIR TERMINAL,  
LOS ANGELES, CALIFORNIA  
Atlanta • Boston • Chicago  
Honolulu • New York  
• WORLD'S LARGEST OPERATOR OF  
AIR FREIGHT AIRCRAFT

## Hydraulic Fluid

Some Properties of 512 Non-Inflammable Hydraulic Fluid  
Approved under Specification MIL-F-7080 (AER)  
See Navy (BuAer) Tech. Order 13-51 for Procedure

Flammability: Non-flammable as a spray or liquid. Resistant to direct ignition, after brief exposure of water. Conforms to Specification MIL-F-7085 (AERD)  
Flash: No flash, -76° F. flash of smoke.  
Evaporation: (4 hours at 35° F.) Residual 100% volatile, oily and not hard or tacky.

Initial Freezing Point: When subjected to a temperature of -65° F. for 6 hours in a laboratory environment under conditions of intermediate environment, the fluid shows no evidence of crystallization.

Low Temperature Fluidity: (10° F. to 72° F.) While opaque fluid.

Volatility: The component materials are no more volatile than water. Loss of evaporation of 0.005 at 30% of Hg will not cause precipitation, separation or any visible change in the appearance of the fluid.

### Viscosity

at 70° F.  
at 40° F.  
at 20° F.

10 Centistokes—Minimum  
100 Centistokes—Maximum  
300 Centistokes—Maximum

Shear Stability: No change in viscosity due to shear breakdown  
Specific Gravity: At 70° F. is 1.007 F. Average is 0.991

### Coefficient of Thermal (coefficient)

at 70° F. average 0.00018

100°F. to 120°F. average 0.00018

10° F. to 230° F. average 0.00016

100°F. to 230°F. average 0.00016

100°F. to 230°F. average 0.00016

Specific Gravity: 1.00 at 70° F. 0.995 at 20° F.

Specific Gravity: 1.00 at 65° F. 0.991 at 20° F.

Specific Gravity: 1.00 at 60° F. 0.987 at 20° F.

Specific Gravity: 1.00 at 55° F. 0.983 at 20° F.

Specific Gravity: 1.00 at 50° F. 0.979 at 20° F.

Specific Gravity: 1.00 at 45° F. 0.975 at 20° F.

Specific Gravity: 1.00 at 40° F. 0.971 at 20° F.

Specific Gravity: 1.00 at 35° F. 0.967 at 20° F.

Specific Gravity: 1.00 at 30° F. 0.963 at 20° F.

Specific Gravity: 1.00 at 25° F. 0.959 at 20° F.

Specific Gravity: 1.00 at 20° F. 0.955 at 20° F.

Specific Gravity: 1.00 at 15° F. 0.951 at 20° F.

Specific Gravity: 1.00 at 10° F. 0.947 at 20° F.

Specific Gravity: 1.00 at 5° F. 0.943 at 20° F.

Specific Gravity: 1.00 at 0° F. 0.939 at 20° F.

Specific Gravity: 1.00 at -5° F. 0.935 at 20° F.

Specific Gravity: 1.00 at -10° F. 0.931 at 20° F.

Specific Gravity: 1.00 at -15° F. 0.927 at 20° F.

Specific Gravity: 1.00 at -20° F. 0.923 at 20° F.

Specific Gravity: 1.00 at -25° F. 0.919 at 20° F.

Specific Gravity: 1.00 at -30° F. 0.915 at 20° F.

Specific Gravity: 1.00 at -35° F. 0.911 at 20° F.

Specific Gravity: 1.00 at -40° F. 0.907 at 20° F.

Specific Gravity: 1.00 at -45° F. 0.903 at 20° F.

Specific Gravity: 1.00 at -50° F. 0.900 at 20° F.

Specific Gravity: 1.00 at -55° F. 0.897 at 20° F.

Specific Gravity: 1.00 at -60° F. 0.894 at 20° F.

Specific Gravity: 1.00 at -65° F. 0.891 at 20° F.

Specific Gravity: 1.00 at -70° F. 0.888 at 20° F.

Specific Gravity: 1.00 at -75° F. 0.885 at 20° F.

Specific Gravity: 1.00 at -80° F. 0.882 at 20° F.

Specific Gravity: 1.00 at -85° F. 0.879 at 20° F.

Specific Gravity: 1.00 at -90° F. 0.876 at 20° F.

Specific Gravity: 1.00 at -95° F. 0.873 at 20° F.

Specific Gravity: 1.00 at -100° F. 0.870 at 20° F.

Specific Gravity: 1.00 at -105° F. 0.867 at 20° F.

Specific Gravity: 1.00 at -110° F. 0.864 at 20° F.

Specific Gravity: 1.00 at -115° F. 0.861 at 20° F.

Specific Gravity: 1.00 at -120° F. 0.858 at 20° F.

Specific Gravity: 1.00 at -125° F. 0.855 at 20° F.

Specific Gravity: 1.00 at -130° F. 0.852 at 20° F.

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Specific Gravity: 1.00 at -165° F. 0.831 at 20° F.

Specific Gravity: 1.00 at -170° F. 0.828 at 20° F.

Specific Gravity: 1.00 at -175° F. 0.825 at 20° F.

Specific Gravity: 1.00 at -180° F. 0.822 at 20° F.

Specific Gravity: 1.00 at -185° F. 0.819 at 20° F.

Specific Gravity: 1.00 at -190° F. 0.816 at 20° F.

Specific Gravity: 1.00 at -195° F. 0.813 at 20° F.

Specific Gravity: 1.00 at -200° F. 0.810 at 20° F.

Specific Gravity: 1.00 at -205° F. 0.807 at 20° F.

Specific Gravity: 1.00 at -210° F. 0.804 at 20° F.

Specific Gravity: 1.00 at -215° F. 0.801 at 20° F.

Specific Gravity: 1.00 at -220° F. 0.798 at 20° F.

Specific Gravity: 1.00 at -225° F. 0.795 at 20° F.

Specific Gravity: 1.00 at -230° F. 0.792 at 20° F.

Specific Gravity: 1.00 at -235° F. 0.789 at 20° F.

Specific Gravity: 1.00 at -240° F. 0.786 at 20° F.

Specific Gravity: 1.00 at -245° F. 0.783 at 20° F.

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Specific Gravity: 1.00 at -295° F. 0.753 at 20° F.

Specific Gravity: 1.00 at -300° F. 0.750 at 20° F.

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Specific Gravity: 1.00 at -585° F. 0.580 at 20° F.

Specific Gravity: 1.00 at -590° F. 0.577 at 20° F.

Specific Gravity: 1.00 at -595° F. 0.574 at 20° F.

Specific Gravity: 1.00 at -600° F. 0.571 at 20° F.

Specific Gravity: 1.00 at -605° F. 0.568 at 20° F.

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Specific Gravity: 1.00 at -675° F. 0.526 at 20° F.

Specific Gravity: 1.00 at -680° F. 0.523 at 20° F.

Specific Gravity: 1.00 at -685° F. 0.520 at 20° F.

Specific Gravity: 1.00 at -690° F. 0.517 at 20° F.

Specific Gravity: 1.00 at -695° F. 0.514 at 20° F.

Specific Gravity: 1.00 at -700° F. 0.511 at 20° F.

Specific Gravity: 1.00 at -705° F. 0.508 at 20° F.

Specific Gravity: 1.00 at -710° F. 0.505 at 20° F.

Specific Gravity: 1.00 at -715° F. 0.502 at 20° F.

Specific Gravity: 1.00 at -720° F. 0.500 at 20° F.



Thomas A. Edison.

## Cuts Cost In Half with SPEED NUTS®

**EDISON** specifies SPEED NUTS® after cost comparisons showed 50% savings over other self-tightly acceptable fastening methods.

• In the very earliest design stages of their aircraft fire detection relay panel engineers of Thomas A. Edison, Incorporated, checked various methods of attaching connectors to the panel.

Their requirements were rigid. The fastening means had to be light in weight, resist vibration, reduce loosening, provide quick and easy assembly and be as low in cost as possible. All aircraft connector mounting holes proved to be the only fastener that qualified on all counts. Connectors are quickly

locked through these mounting caps and the panel.

As for cost, **Tommerman SPEED NUTS** turned in the lowest record by far. Early 1955 assembly savings over acceptable military connector fasteners were proved by faster, easier, better SPEED NUTS.

Complex or simple, solving fastening means is **Tommerman's** specialty. New booklet, "A Story of Quality," reveals how we can help you. Write for your copy. **TINNERMAN PRODUCTS, INC., Dept. 12, Box 6686, Cleveland 1, Ohio. In Canada: Dominion Fastener Ltd., Montreal. Distributors: Air Associates, Inc., Teterboro, New Jersey.**

**TINNERMAN**  
**Speed Nuts®**  
The **FASTEST THING IN FASTENINGS®**



## Flammability

### Rating

Based on the Flammability/Inflammability Scale

Fluid	Flammability/Inflammability Rating
Aerosol Canister	38
160 Proof Alcohol	72
Gasoline	73
Gas Aircraft Engine No. 2013	76
Oil Aircraft Engine No. 1120	88
Urea LR-400-X	95
Urea 10 Hg 150-X	94
Tricresylphosphate	94
Hydrogen	94
Tricresylphosphate	94
Benzyl Tricresylphosphate	94
Monastrate Sustane-140	92
Monastrate Formulations No. 5	less than 10
Hydrochloric Acid	0
Hydrogen H-41	0
Hydrogen H-7	0
R-134a Hydrogen Fluid	0

SOURCE: CIA report "Determination of Explosive Power of Various Military Explosives," 1954. DATA

the liquid and vapor phase, and to deactivate contact metals in liquid chlorine vapors which would otherwise react in the metal to contactants existing throughout the hydraulic system.

In spite of many years of extensive laboratory testing, it was not until recently that H-2 would do under prolonged storage condition. To date it has been used in Navy AD strength for two years and PIVs for over one year. Test and field H-2 functioned perfectly in all respects, when proper finishing technique was used.

• What It's Like—H-2 is some of H-3's characteristics and handling requirements as determined by flight and lab tests.

• Water loss due to evaporation is less than one percent in a storage of Naval aircraft operating for more than one year. There is absolutely no agglomeration up to 320 deg and boiling point is 218 deg.

• Anodization and self-oxidation of quaternary rubbers "O" rings were not finished out in a result of continuous submersion as H-2. Being soluble in the fluid, they were not stripped but remained unchanged on the surface of the "O" rings.

• To insure complete protection from corrosion, closed parts should be completely submerged in H-2. If this is not feasible, they should be filled with



## NEW STANDARD D-C CONTROL PANEL BUILT TO USAF EXHIBIT No. MCREXE22-89A

Here is the new standard d-c control panel. This compact, lightweight panel embodies outstanding Westinghouse contributions to the regulation, control, protection and maintenance of d-c aircraft systems.

Many of the built-in features are the result of successful use in other Westinghouse panel designs. Your guarantee of performance-proven equipment.

The new panel is of the simple plug-in type with a unique regenerator which can be quickly inserted or removed. Vibrations and shock isolators are built into the unit around the center of gravity.

Accurate generator selectivity in a multi-generator system prevents hazards of generator overoperation during overloads and overload conditions. Special design in the field relay provides trip-free operation... both mechanically and electrically.

For further information, call your nearest Westinghouse Office or write Westinghouse Electric Corporation, Aircraft Department, Erie, Pa.

YOU CAN BE SURE... IF IT'S  
**Westinghouse**



**AVIATION  
EQUIPMENT**

**First to harness dynamic turboprop power!**

# Aeroprop

A new day has dawned in the history of flight—the day of turboprop power!

For the dynamic combination of turboprop engines and Aeroprop open up a green and new era when cargo ships, bombers and fighters will fly at sub- or super-sonic speeds. And they'll fly with range and performance that until now have been only a dream—a dream brought to life on the drawing boards of the men at Aeroprop.



Aeroprop's Bell 407 mounted on a test stand.

Aeroprop, working in close contact with the Navy and the Air Force, has pursued projects design for turboprop power...—has by its research developed outstanding experimental work. May it the tool of propulsive device increase speed for all safety to future.



AEROPRODUCTS DIVISION  
GENERAL MOTORS CORPORATION  
SAULTON, OHIO



*Building for today  
Designing for tomorrow*



# Aeroprop

AN-607 (MIL-F-6081), drop-dosed and plated. Hollingshead rheostats are working on a strong fluid capacitor in H-2 which will be available soon.

• Case should be taken not to spill H-2 on plastic, painted and flexible. It should be a solid, good, non-porous material. If spilled, it should be rinsed from painted surfaces within three to four hours, no damage will result. Painted areas may be protected with AN-L-37 lacquer.

• Strength is no problem provided fluid is kept in closed containers and is not subjected to extremely high temperatures or to moving parts.

• Pipe sections and shapes should not contain metallic constituents such as lead. Such sections would be dissolved and dispersed throughout the system by H-2, possibly clogging filters and impellers in the flow, which would result in damage to moving parts.

• Components should be taken not to contaminate H-2 with sensible materials. Possible effects of such contamination include reducing the high temperature physical stability, effectiveness of the corrosion inhibitors and, possibly of the corrosion inhibitors.

• Inorganic salts and/or acids which may be contained in leather bedding bags should never be washed because of the manner in which they composed is the volume of fluid.

• Numerous tests exposing a variety of electrical wire coating and insulation to H-2 resulted in the fluid having no deleterious effect on the materials involved. They were properly lubricated. Wires immediately exposed to fluid should be vinyl coated.

• Fluid used in glass parts exposed to H-2 should not be chlorinated hydrocarbons (methyl, ethylchloride, methyl-ethylene) which would undergo hydrolysis and promote serious corrosion. If parts have been cleaned with these or other chlorinated solvents, they must be saturated in a 5 percent chlorine bath at 140 deg. F. for 30 min. Standard Sodium Pyro-81 should be used.

• Other Products—Hollingshead produces a variety of products for the aviation industry. Among these: aircraft preventive maintenance compounds, aircraft cleaning products, protective coatings, aluminum polish, paint removers and carbon removal compounds. Metal-It is a polymerized aluminum flake material, has proved useful to H-2 on forward leading edges.

Among latest developments are new anti-dustant impregnants (MDI) for jet engines.

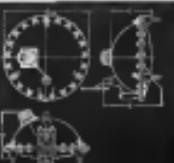
Hollingshead's New Products division, headed by A. E. Morris, is working with him on the work on the formation of H-2 into fluorinated hydrocarbons, under the direction and guidance of Dr. Espy.



**PRESSURE SWITCHES**

HELP MAKE TODAY'S AIRCRAFT  
***Safer Than Ever!***

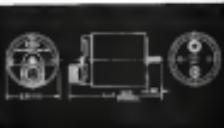
Greater safety for your planes is the goal of every Aerotele designed control. To cover every possible contingency, our instrument specialists have developed hundreds of different types of controls. Below are a few typical examples of Aerotele pressure switches covering a host of applications. Aerotele is supplying thousands of controls of these types to meet today's demands. They are playing an important part in raising the high standards of safety on commercial and military aircraft.



**SENSITIVE LOW PRESSURE SWITCH SERIES P904**

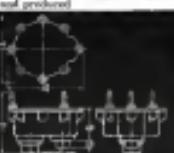
Differential: Type for Cabin Air  
Sensitivity: 10° FAD  
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## Tank Stripping

Why one airline kept  
job at home, and how  
it did the work.

A case record of one airline that decided to do its own stripping and is saving of DC-4 integral fuel tanks it purchased by Braniff International Airways.

R. A. Phane, Braniff Maintenance Manager, has described the Aviations Week data concerning the unique hot water stripping technique which should serve as a model guide to other carriers faced with the same problem. Following are the most pertinent facts as outlined by Phane:

► **Ground Fire Decision**—Braniff made its decision, involving its fleet of 100 DC-4s, after getting bids from outside firms that varied at the extreme. Two factors bearing on the airline's decision to do the job itself were price would not be increased from base for three weeks, and "Group Operations" will could be performed simultaneously with tank work. Also, although an untried technique, it would be tested for future tank work.

Stripping compound chosen was Turp 232E (AVIATION Week, June 5, 1956, p. 45). This material can be fire tested with severe or cold water, is capable of being cleaned, is effective on white tinned and brass N types of tank interior, and has very little dissolving action on synthetic rubber. It levels the bond between anode and tank resulting in minimum stripper consumption and greater ease in removing weld residue from the tank.

For determining whether stripping or hot water methods of stripping would be best, note:

- **Strip-on requires less material (about \$100 per plane) but more time than all methods and are expensive.**
- **Paint-and-dissolve requires approximately \$1,200 of material per plane for a fleet of nine. But, during the steel time these trials are held during which the stripper does its work, personnel could be deployed to do other work required by Group Operations that is going on concurrently.**

Braniff chose the G.D.-dissolve method.

To **Get Ready**—Preparing a tank for stripping, the first step is to remove all insulation, insulation must be removed, exterior tank disconnected, anode plugged. Tank access doors are replaced with gully doors and baffle strapping the doors are removed—the latter expedite raising away the stripper.

Stripper is driven from 1,000 gal

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**THROUGH-PIPE DETECTION** of either inside of shell and steel members Fenwal improves design systems fire and overheat detectors for specific aircraft needs. The shell is the temperature-sensitive member. When properly set with either temperature detector, (which comply with either C.I.A. Material Standard Grade C-1) or C.I.A. Material Standard Grade C-2) in series with the T.A.M. switch, alarm will operate.

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Temperature Control Engineers

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# McGRAW-HILL

Publishing Company, Inc., 100 West 45th Street, New York 36, N. Y.

strong tools and passed through in less in the city down this road about eight-easy hours. During these trials, from 36 to 72 hours, the drivers reported no problems, such as sagging or stripped rivets, even though the tools were dropped.

Tools seem clean, unbattered in the straps, are used as control tools in democratic program, stripper is working in the task. When they indicate that the job is done, tools are gravity-drawn into storage tanks and wing tanks are used with water water. If all metal is not removed, process is repeated until it is.

Stripping-Sound structural work is important. Sound erosion that about 90 percent of a tank had received when it was built by its crews and other structural members. It shows the tool holds great potential for tight tools and improved structural strength as the result of good coating practice.

Installation of a new Douglas Aircraft landing doubler and a wing stress strut caused a chronic leak path between doubler and strut. The strut and strutted the troubleshoots cracking tool subsequent to that of existing doubler.

Final cleanup is accomplished with a liquid solvent, leaving a low moisture tank floor and application of a phosphate coating designed to slightly enrich surface on which solvent is to be applied.

If the tools are mechanically and chemically clean, stripping begins. To facilitate this job, Brandt removes all internal tank tools.

The entire unit Minnesota Mining and Manufacturing Co.'s EG-680 solvent, metacrylic acid applied to all surfaces. Grit may be taken to work all air pockets out of the EG-680, EG-750 is casted with EG-750 to provide a more determined action of EG-750 also gives this solvent against the tools of corrosion.

But, prior to its applications, tools should be pressure-tried at 1.5 lb./sq. in. for 30 minutes with an ammonia to insure a properly leak-proof tank. When the Cast-Bond® removes its coat for the whole job \$12,000 per plane for ships without outer wing tanks and \$15,000 for ships with outer tanks.

Cost distribution is approximately divided each for preparing the plane for stripping, plane actual stripping, structural work, and mounting and fitting the tools.

These tools that Brandt has manufactured are of no DC-4. Since in reading, the planes have flown without any looks being detected, Brandt feels that the investment made in creating these tools will certainly be money well spent towards a trouble free basis of cost.

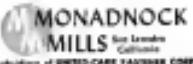
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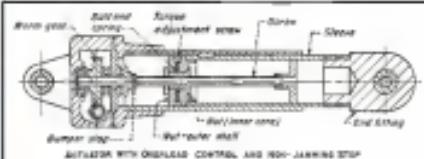
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## NEW AVIATION PRODUCTS



### Non-Jamming Stop When Limit Switch Fails

A new type of non-jamming stop and overload control designed to prevent damage to electro-mechanical actuators in event of a limit switch failure has been developed by the Greenleaf Corp. Co. The device is a simple mechanical device integral with an actuator marketed by the firm. It adds little to the overall weight of the actuator according to the maker. Patents are pending.

► **Silky Smooth**—Essentially, the actuator device is an overrunning mechanism (see drawing). It consists of a nut split into two halves—an outer shell and inner core. These normally are locked together by spring-loaded ball bearings housed in outer shell pressing into the teeth in the inner core. The outer shell of the nut is sealed to prevent dust and water from entering the bearing. Inner core of nut is threaded on the inside which is turned (via worm gear assembly) by electric motor.

Normally, the complete nut moves back and forth linearly on the screw, rotating, retarding or extending the screw to which it is attached. In either direction of movement, a limit switch normally stops the motor when full travel has been attained.

#### ► Limit Switch Failure—This is what

a guided missile<sup>11</sup> nose has been placed on the market for other aviation applications by Electro-Mech Laboratory.

The case (weighing 79 oz.) has two resistor stations and can be used where an exceedingly small mechanical form must be converted into two equivalent electrical voltages. With current carrying capacities up to 100 milliampers, it provides two outputs sufficient to operate simultaneously controlling and recording an indicated resistance without auxiliary power. The unit can also provide two other further audio and/or subaudio outputs in case weight and complexity of such additional

To make potential needs, the two resistor sections in the potentiometer

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EXTERNAL WRENCHING NUTS

... introduce the FLEXLOC self-locking principle  
and eliminate all metal fasteners. The exceptional  
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use of FLEXLOC fasteners in the aircraft industry.

Other construction advantages:  
Metal nuts with maximum weight  
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The one-piece FLEXLOC is both a stop and a lock nut, due to a self-locking principle which locks positively, even under extreme vibration. These are generally available within a few days. "Thin" and "Dome" types, M2 and M4 threads, generally supplied by stock. U. S. imports, Germany, etc., and Canada for aircraft use.

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are offered in sizes ranging between 10 and 10,000 aircraft nuts with area rates up to 965 pieces. Shaft torque can be as low as .055 or as high as .500. Satisfactory operation at vibration frequencies up to 425 cps has been verified by actual flight tests, the company reports.

The fastener is about  $1\frac{1}{4}$  in. long and 14 in. diameter and weighs a total of .055 in. diameter. Address: 125 Broadway, New York 7.



## Attachment Hooks

Sheet bolts can be quickly attached or removed from nuts with new "Beverline" attachment hooks, introduced by Gordon D. Brown & Associates.

Hooks have no springs or intricate parts, consisting simply of two opposing metal tabs which interlock over attachment pins. Once in place, they are locked by the action of welding. Hooks are heat-treated, carbon-tempered chrome-molybdenum steel, ruggedly built to meet new strength requirements of CAA/TSO C-22, the major airworthiness address. Address: 407K Connecticut Center St., Beverly Hills, Calif.

## ALSO ON THE MARKET

Code heads of metal are automatically stamped and applied to electrical wire leads at rates up to 1,200/hr. with new, electronically-operated wire binding machine. Standard feed rate machine can strip four feed spools. Made by Avicraft Marine Products, Inc., 3100 Boston St., Wrentham, Mass.

Priming gun device for setting agents used in lighting fast, simple use of agents by directly introducing into base liquid. Gun permits complete combustion for any type of fuel. Made by Selord division of American Marine Paint Co., 311 California St., San Francisco.

PCA-100 penetrating and setting agent paint can be applied on metal surfaces, it will be equally effective in preventing rust on new metal or stopping rust action on metal already corroded. Made by Fast Corp. of America, Pidley Bldg., Cleveland 14, Ohio.

# FINANCIAL

## Relative Market Action

Airline Aircraft Common Stocks

Company	1966 High	1966 Low	Close 1966	June 30, 1967
Boeing	34	31	32	32
Bell	36	33	35	35
Boeing	35	33	34	34
Convair	36	318	353	153
Curtiss-Wright	32	328	83	83
Douglas	35	350	94	94
Fairchild Engine & Gear	3	9	8	8
General	35	270	38	38
Lockheed	41	420	344	344
Marine	46	218	135	135
McDonnell	37	59	158	158
McDonnell Douglas	35	17	112	112
Republic	27	164	113	113
United Airlines	31	348	254	254

Source: 500 publications made for stock dividends.

All dividends estimated for 1966 earnings.

\* Adjusted for 40% stock split.

Fairchild Engine, North America, Northrop and United Aircraft also announced equities which established all time new peaks in market quotations earlier this year. That market adjustment has been rather strong in the downards.

The equities of Boeing, Bell and Lockheed have mostly reached their 1966 peak quotations during their recent boom. However, the basic position of all three of the major aircraft firms is now far from clear, depending on the condition at the end of World War II.

Convair established the distribution of leading in 1966 market quotations long before the Korean incident and it ranks with the best performance key stock market equity. Early that year, the Convair shares reached a market value of twice that double that of the 1966 peak. Moreover, at June 30, 1967, after a sharp decline had set in, Convair still sold higher than its 1966 peak. It was the only aircraft equity with this distinction. Convair's best price prior to 1958 was in 1951 and is now below that level.

What is not generally appreciated is the fact that these companies showing excellent earnings for 1950 due to front bookings that had very little, if anything, to do with actual revenue as a result of Korea. The sales placed by the Korean war which was largely inspired by Korean events, would normally begin to show up in delivery later this year. It is only necessary to view deliveries of the aircraft industry for the 1955 first quarter to appreciate the basic element necessary to front bookings and sales.

Aircraft equities, by declining sharply, felt the immediate market effect in anticipating a continuation of military purchases. This is nothing more than the reverse of market sentiment which existed at the Korean war break out a year ago.

At that time, aircraft securities were bid up very sharply and continued at high levels until 1951. This is reflected by the 1955 first quarter. It can be noted that the majority of aircraft shares reached market value the year preceding the peak quotations established during 1956. It was in the first quarter that aircraft shares, for the most part, recorded all-time high quotations until very recently.

► **Hawk-Hoppe**—The Korean revision of last June marked considerable interest in aircraft equities. It was not very long before hawkers were holding out the promise of continued operations for a number of years to come. It was not unusual for individual companies to show unfilled orders aggregating four

to ten times the amount of their last annual sales.

Little regard was accorded the risk involved in the Korean war and an equity book will be recorded as a result of Korea. The sales placed by the Korean war which was largely inspired by Korean events, would normally begin to show up in delivery later this year. It is only necessary to view deliveries of the aircraft industry for the 1955 first quarter to appreciate the basic element necessary to front bookings and sales.

► **Stev-Marke, Fair-Contag**—With taking up in mass aviation largely accomplished, augmented aircraft deliveries should be no burden. Large delays due to the delay which kept production pell-mell, the aircraft industry is believed as the annual schedules are by the military. This has been confirmed by the Department of Defense which says that it desirable to slow down production so as to permit the implementation of the latest technological designs and avoid a too rapid build up of planes that can become obsolescent.

But this does not mean that the large aircraft procurement programs will be scuttled. It is known that the 14 major aircraft manufacturers have some contracts totaling \$7.6 billion. This group and others will share in a projected \$3.6 billion a aircraft procurement program to come from the 1952 budget.

Any day-there that these equities will surely move that would backlog will now be spread over a greater period of time. In most instances, the duration of business will still leave sufficient companies with indicated solvency at relatively high levels.

—*Seig Albrecht*

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## AIR TRANSPORT



MILITARY TRAVEL, such as these soldiers returning from Korea, builds needed loads

### Future Looks Better for Nonskeds

Now they can get contracts to fly military personnel, and have found a champion in a Senate committee.

Two events have eased the threat to 55 non-scheduled airlines under business death sentence by Civil Aviation Board action. If it stands by its past policy, CAB will put them out of business. The first event is the committee for editorial exemption, if these have been over three non-scheduled flights a month and 350 percent of them have been done in the last year.

• Defense Department influenced all military transportation offices to contact with the nonskeds for official rank my travel.

• The Senate Small Business Committee Report urged CAB to listen, not kill, the nonskeds industry.

These two events followed another important one for the nonskeds: a committee petition against CAB enforcement of a regulation that would have forced all non-scheduled nonskeds to have eight a month, to take effect this month.

• Still Tense to Due-Bill despite these three recent encouraging news from the military, one from the Senate and one from the federal court—the nonskeds still are not out of the woods. Some 200 others even while now doing a business of close to \$100 million a year.

CAB in the past has delayed it will invoke the letter of regulation if it may resolve that prolonged equipment operations—defined as more than three trips a month. But the Board's next

move here changed view that policy first was unwise.

AVIATORS—West filed new CAB Chairman Donald Nyrop with his thoughts of the Senate committee in port, indicating the CAB, Nyrop pointed out that, as the first place, he hasn't had yet seen the final report; in the second place, from what he based at the report it failed to point out Gandy's problems; and, in the third place, the person from the Civil Aeronautics Board is a deliver one from the one that set the three-month limitation on nonskeds operations.

Only two of the five non-scheduled were on the original CAB policy committee—Donald Gandy and John Lee Clark and Clark's successor Joseph Adams and Clark's Gandy joined the Board later.

Ironically, in 1946 the non-scheduled airline industry was born with official sponsorship. CAB granted all non-scheduled a blanket exemption to operate, but the Army Administration urged them to buy non-scheduled stock at low prices. Veterans Administration and the Reconstruction Finance Corp. made money available, and other administrators agencies helped. Under these government standbys hundreds of war veterans got into business as "big business operators."

• MILITARY BUSINESS—Last month and this, the non-scheduled airlines have been doing more business than ever be-

fore, possibly for these two reasons: Soldiers are home, and the nonskeds' rapid recent progress in getting as much travel by saddle and low income families. Business is so good now that many nonskeds want to buy more planes. But they can't now with CAB won't lead a char to a current that CAB is officially committed to put out of business.

At Coach Transport Air, opened up Federal Bureau for the nonskeds this spring after working since the fall of the year to get CAB's acceptance. The Military Traffic Service at the Defense Department required that before it would permit nonskeds to have official representatives at military bases, along with scheduled airline, less and mail transportation.

The new flight's operation were not high gear about a month ago, making haphazard runs with charter-type flights about to an airport near Seattle, but it has been a success. The Military Traffic Service told the nonskeds in effect: Do a good job on the military flights and we'll let you on the official military travel!

In its first month of running full-blown operations, the Air Coach Transport Air has already received special commendations and letters of thanks from transportation officers of the many camps. ACTA flights have served. So now the nonskeds are going to contract for official military travel as well.

• OFFICIAL STANDING—Military orders have gone out to all local and regional transports and offices to ensure official travel with the nonskeds association just as they have always done with the association of the certified airlines, the railroads and the bus lines.

The military works fully through the accredited associations to schedule and contract transportation—not through the individual companies. The Air Coach Transport Air was formed by the domestic nonskeds less than a year ago. Another association was formed by the international nonskeds, the International Air Transport Association—IATA.

The two associations book military passengers for each other's member airlines. ACTA has regional directors with offices at La Guardia Airport, New York; Miami; International, Chicago; Jackson City, Kan.; San Francisco and Buffalo. ACTA has about 25 branch military traffic representatives at various camps such as Fort of New York, Fort Dix, Camp Kilmer, Fort Devens, and Fort Monmouth in the New York area. Head office of ACTA is in Washington.

The nonskeds plan on much more liaison growth ahead, especially with military. ACTA is now sending telegrams to contact all arrival offices. And the head office is moving into the

















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